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PIPE LINE INDUSTRY

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JULY
1957

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MODERN STATIONS
Electric Giants Pack Powerful Punch 40

OPERATING TESTS
Make Sure Emergency Shutdowns Work 48

BETTER CONSTRUCTION
Dams Check Erosion - - - Protect Pipe 50

FIRE FACTS
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MANAGEMENT MEMO
How You Can Save Two Hours a Day 64

For a "Quick Look" at this issue, turn the page .

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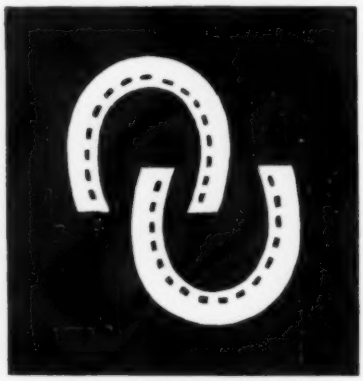
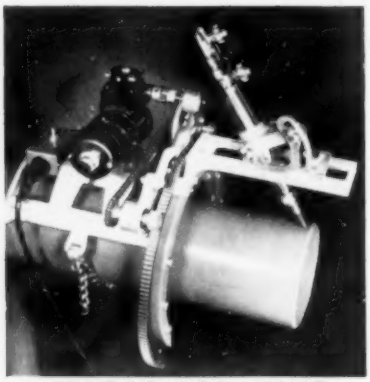
2 MORE CHAMPIONS . . . .





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PIPE LINE INDUSTRY

CONTENTS and Quick Look

July, 1957 Vol. 6, No. 7

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Texas Eastern's New Stations Pack A Powerful Punch

☐ Here is the story behind the company's initial operation of the giant 15,000 horsepower synchronous motor-centrifugal compressor units in mainline gas transmission service. Cost of the new single unit stations totaled only $114.04 per installed horsepower, about half the cost of older multiple unit stations. Two new dual 7600 horsepower gas turbine stations also performed well in early operating tests; three more will be in service this year.

By Melvin A. Judah ..... Page 40

"Dry Run" Tests Shutdown Systems

☐ Will your emergency system shut down swiftly and safely when necessary without a mishap? Because Panhandle Eastern Pipe Line Company wanted to make sure, every piece of emergency control equipment is being used periodically under actual operating conditions. Here is an excellent case history that will give some good pointers for any station ..... Page 48

Dams Hold Cover Near Ravines

☐ Natural Gas Pipeline Company of America built 24 drop-inlet type dams to stop severe erosion across the right-of-way of its new 20-inch supply lateral in North Texas. Heavy rains have since proved the value of the dams in holding backfill near gullies, reclaiming ravines and boosting landowner relations ..... Page 50

Floating Roof Tank Fires Can Be Controlled

☐ Lightning induced fires can best be prevented by making enough direct and straight channeled contacts between the roof and shell of the tank. Once a fire has started, however, it can be fought successfully with portable equipment if large sections of the seal have not been burned out.

By J. L. Risinger ..... Page 52

Facts About Pump Packings and Seals (Part 2)

☐ This second article in a handbook on seals, packings, and glands tells how packings are made from a variety of materials. Tables showing the properties of many materials used for packing will serve as a handy guide to help you select the right packing for any pipe line service conditions.

By Harold Woodhouse ..... Page 56

Find Beam Deflections by Easy Methods (Part 2)

☐ Here are some time saving short-cuts that can be of real value to the station design engineer in analyzing beam deflections. This second part covers simple and cantilever beams with concentrated loads.

By Charles H. Fork ..... Page 60

Make Those Minutes Count!

☐ Four deadly time wasters are taking big chunks out of your work day. The culprits: Your desk—letter box—telephone—and visitor's chair. Here are some excellent ways to transform these big losers into time savers.

By Robert E. Johnson ..... Page 64

REGULAR MONTHLY DEPARTMENTS

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

The 'One-Way' Fight

How would you feel if someone pinned your arms so a bunch of guys could punch you to a pulp? Helpless? That's a tame word for it.

Yet the pipe line industry is being backed into just such a corner. With public opinion holding the industry at bay, a few government officials and members of the press are free to flail away with blast after blast of half truths and untruths. Their words, based on gross inexperience in industry affairs, are giving pipeliners a public black eye—and if allowed to continue, could cripple the industry economically. Nothing can throttle free enterprise faster than government control.

Let's review just one of the recent happenings: On June 12, Joseph O'Mahoney's Senate subcommittee held an unprecedented public session to let the press in on a preliminary report that thoroughly lambasted the pipe line industry. Reason for the attack: To persuade the Justice Department to start an immediate investigation of possible antitrust violations by "big oil" ownership of the pipe line industry. Some of the statements from that session:

- In no aspect of the oil industry has the monopoly of the few been so all-inclusive as in the case of crude oil pipe lines, which are all but 100-percent owned or controlled by the major oil companies.

- Control over transportation has been found to be the most effective method of controlling the U. S. oil industry.

- Pipe lines have the power of life and death over independent competitors.

These statements, prepared in conveniently brief form, hit the front pages of newspapers across the nation. Although Senator O'Mahoney said the pipe line companies were given an opportunity to reply to the charges, no immediate reply was made.

What good would it have done? Oil industry spokesmen repeatedly, year after year, have presented the true facts to government investigators and legislators—only to run smack against a stone wall. It is mighty hard for a senator or congressman to act on the true facts of an issue when his decisions are controlled by what the voter wants. And too often in the case of the oil industry, what the voter wants is based on his subjection to faulty information received from completely uninformed "experts."

Instead of having its side of the case clearly evaluated, the industry must sit back and continue to be lashed by outspoken government critics who can say what they want without reprisal. Senators and congressmen are given immunity from slander suits resulting from statements made on the floor of either house. Industry has no recourse.

An eastern newspaper recently ran a series of ten full-page feature articles viciously attacking nearly every aspect of the oil industry. The false information presented is far too voluminous to be presented here.

The oil industry has two recourses in situations such as this:

1. Sue for libel, except for one hitch—there is some question as to whether an industry, as such, can sue a newspaper for libel. However, an association (such as API) can in many states, including New York.

2. Be allowed to present its side of the case in as complete a fashion and just as prominently as its critics. There is a hitch here, too. The industry made an honest attempt to give the public the facts during the Harris Bill debate in 1955. The effort resulted in a deluge of all-out editorial attacks against the "oil rich" corporations that were "buying" public opinion.

If these aren't examples of pinning the oil industry's arms to its side, we don't know what is.

Who said democratic justice is based on fair and objective evaluation of both sides of a case?

They're pumping gas to underground storage with this "Oilwell" Direct-Connected Compressor Unit

STUDY this photograph a minute! It's an "Oilwell" DGE-125 direct-connected duplex compressor unit that has just been delivered to location—ready for foundation bolts and piping connections.

It's truly a "packaged unit," even to pressure gages, controls and up-draft cooling facilities for engine and compressors, all mounted on a structural steel skid base.

Note the narrow width of these parallel compressors, powered by an in-line direct drive from the engine through right-angle, spiral-bevel gears.

In this installation . . .

. . . natural gas is being taken from low-pressure field lines, compressed and injected into underground formations which previously contained gas for storage near Zanesville, Ohio. Two 9-inch stroke compressors—one cylinder with 5½-inch diameter and the other with 3⅛-inch diameter—constitute this two-stage, duplex-type unit, which is capable of handling up to 744,000 cu. ft. of gas per day with 125 psig suction and 1,200 psig discharge at compressor speeds of 325 rpm.

Let an "Oilwell" Engineer . . . assist in the selection of the compressor for your next installation, from one of these completely packaged duplex-type units. They're available in 125, 175, 200, 250 and 300 hp sizes.

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UNITED STATES STEEL

Panalarm Annunciator pinpoints process "off-normals"

In the process industries and among users of automatic machinery, trouble is minimized when it's caught early. That's the purpose of the Panalarm Annunciator System—a continuous monitor of your process.

One typical adaptation of the modular Panalarm system is engineered to differentiate between the first "off-normal" and subsequent "off-normals" caused by the first. This feature allows instantaneous recognition of the prime source of trouble in a "chain reaction."

Another adaptation is designed specifically for motor start-up and shut-down. It has also been successfully adapted for supervisory control, pump control and programming.

Your Panalarm sales engineer will be happy to make a survey of your requirements to determine whether a Panalarm system can aid productivity and safety in your process. For electrical and mechanical data on standard systems, request Catalog 100B on your letterhead.

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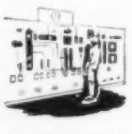
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PIPE LINE INDUSTRY and the PIPE LINE COMPOSITE CATALOG for the oil and gas pipe line industry.

WORLD OIL and THE COMPOSITE CATALOG for the drilling-producing-pipe line industry.

PETROLEUM REFINER and THE REFINERY CATALOG for the refining-natural gasoline-petrochemical industry.

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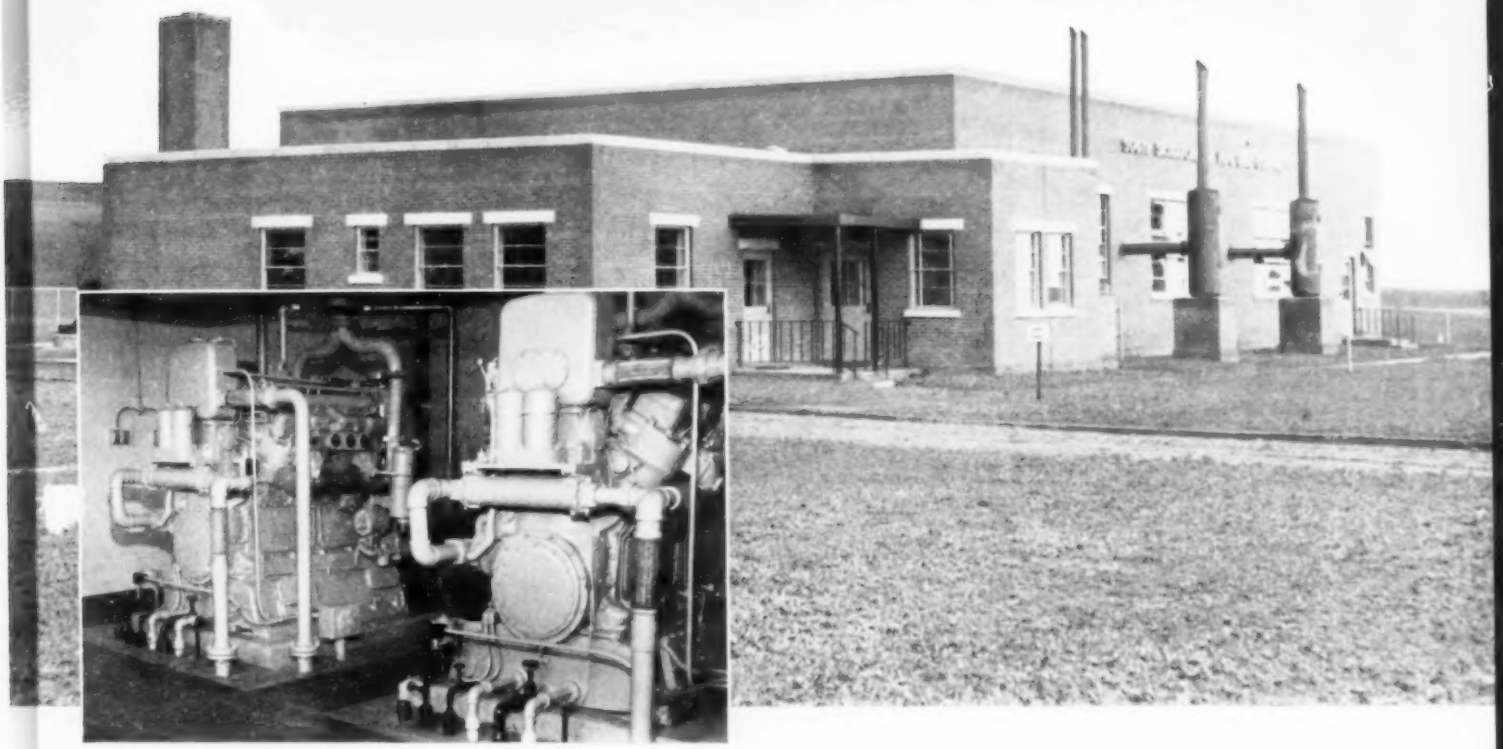
Indexed by Engineering Index and Industrial Arts Index

In Cantuar, Saskatchewan

"Entire operation" of this million dollar pumping station depends on two CAT* Electric Sets



The heart of the Cantuar Pumping Station, owned by the South Saskatchewan Pipe Line Co., is two Caterpillar D364 Electric Sets. These units, used alternately, are each rated at 125 KW at 1200 RPM. But it was their dependability that sold them.

"Our entire operation hinges on their round-the-clock dependability," reports George W. Petrie, chief engineer at the station.

And the operation is a vital one to the company. The Cantuar Station is the main pumping installation on a 158-mile 16-inch line between Cantuar and Regina. It handles a line capacity of 25,000 barrels a day from 33 gathering stations and 120 miles of gathering lines. It is absolutely essential that the electric sets work around the clock—*without failure.*

And now, Caterpillar has a completely new line of dependable generators. They are completely self-regulated and require neither an experienced engineer nor operator.

The line is complete up to 350 KW and the power units can be tailored to your *exact* needs. You can get them equipped with independent gasoline starting engines, air or electric starting, or automatic start-stop for standby. The D375, which supersedes the D364 in the Caterpillar line, can be had in naturally aspirated, turbocharged, Roots blown, or spark-ignition models.

With each electric set you get the added protection of quick, efficient service from your Caterpillar Dealer—always ready to keep your equipment running with parts you can trust. See him soon and select the set that fits your needs.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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A QUARTER CENTURY OF DIESEL LEADERSHIP

For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

Designed for easy, high-speed application by modern machine methods, Transhield is strong and highly tear-resistant. Its light weight permits its use in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Transhield provides a protective membrane of coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers. It cannot rot or decay, thus acts as an enduring barrier to shield pipe line enamels from earth loads and soil stress.

For severe soil conditions use Johns-Manville #15 Asbestos Pipe Line felt . . . proven in service for over 30 years.

For further information about Transhield, write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

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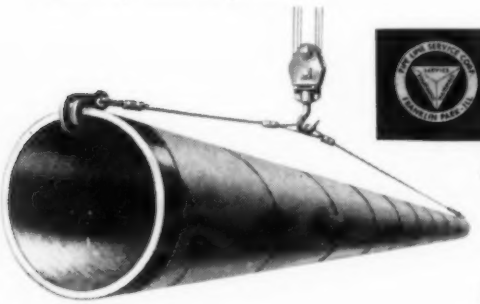
Pipe Protection strategically located

to save you time and money!

Pipe Line Service has eight fully equipped wrapping plants to serve the major steel pipe producing areas in the country! These eight modern plants are strategically located to serve you as the pipe leaves the tube mills, en route to destination, or at a plant in your operating area. Strategic location is more than just convenience—it means substantial savings in storage and handling, lower through-freight costs, and less delivery time to jobsite.

What's more, these plant locations mean that, wherever you buy your pipe, you can get a uniform coating and wrapping job at a nearby PLS plant—no long shipping delays. If needed, you can have pipe wrapped at more than one PLS plant, delivered to the same jobsite, and be sure there is no difference in quality. Call in your nearest Pipe Line Service representative on your next coating job—he'll show you how PLS can give you the finest in pipe protection and still save you time and money.



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Quality pioneers in coating and wrapping pipe for a quarter century

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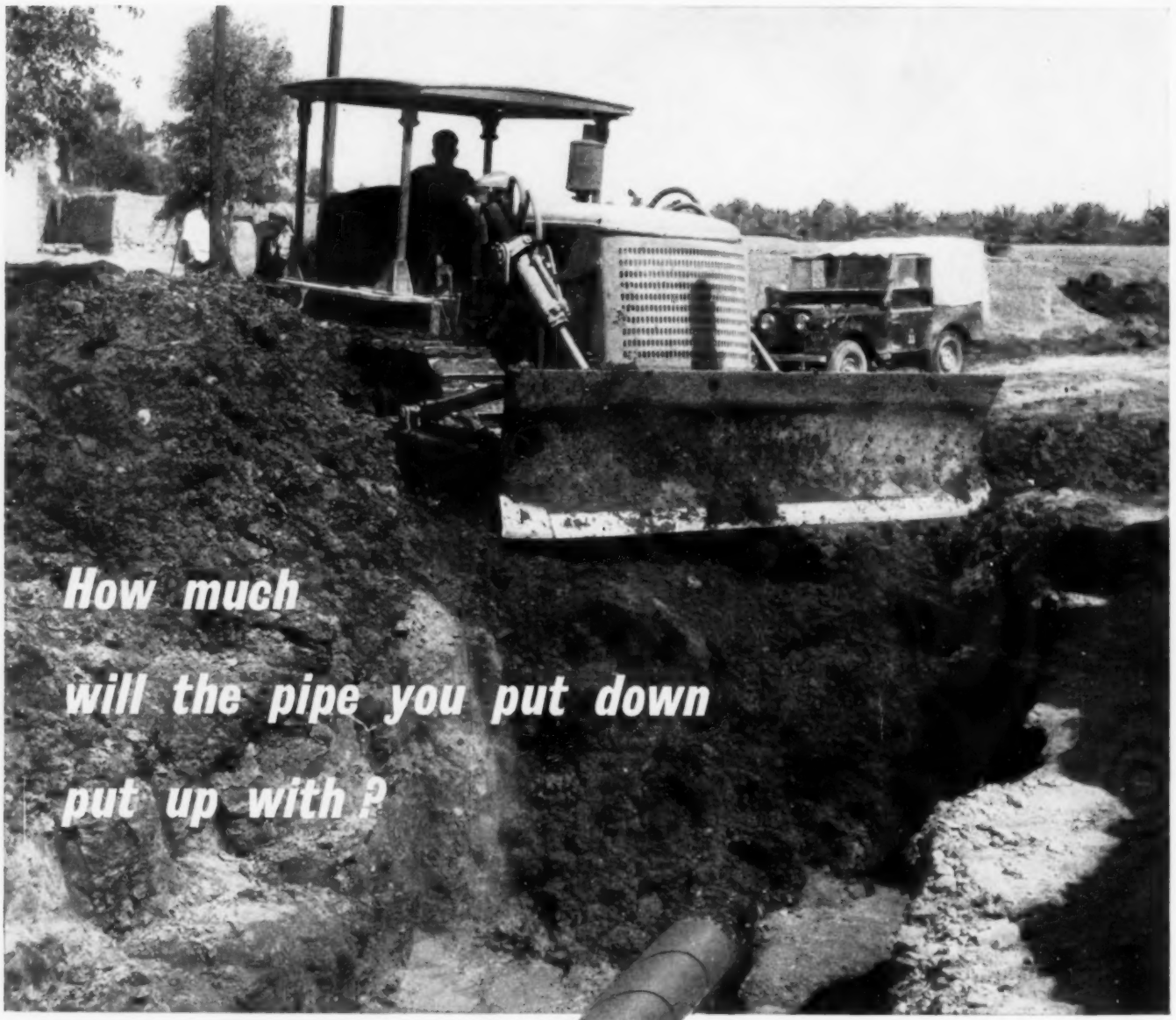

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Maximum resistance to attack by aggressive soils is provided by enamels reinforced with Fibreglass pipewrap. It was used to protect this twelve inch oil pipeline that runs from Baiji to Baghdad.

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The new Bucyrus-Erie 30-B puts the same kind of bite on trenching costs as the popular ¾-yd. 22-B — only bigger.

This new 1-yd. dragshovel has high-speed hoist and swing and powerful digging stroke that eat up yardage. The boom's cambered mid-section provides added clearance for digging deep trenches, makes dumping easier because the dipper can be raised high and brought in close without spilling. Dipper design helps get heaped loads rapidly — assures fast, clean dumping. Full air controls, not just air assist, let the operator work at peak efficiency with a minimum of fatigue.

The 30-B also has traditional Bucyrus-Erie dependability, which means maximum time on the job and long life, with minimum maintenance. Let your Bucyrus-Erie distributor tell you more about how the 30-B can put a bigger bite on *your* trenching costs. 387E57C

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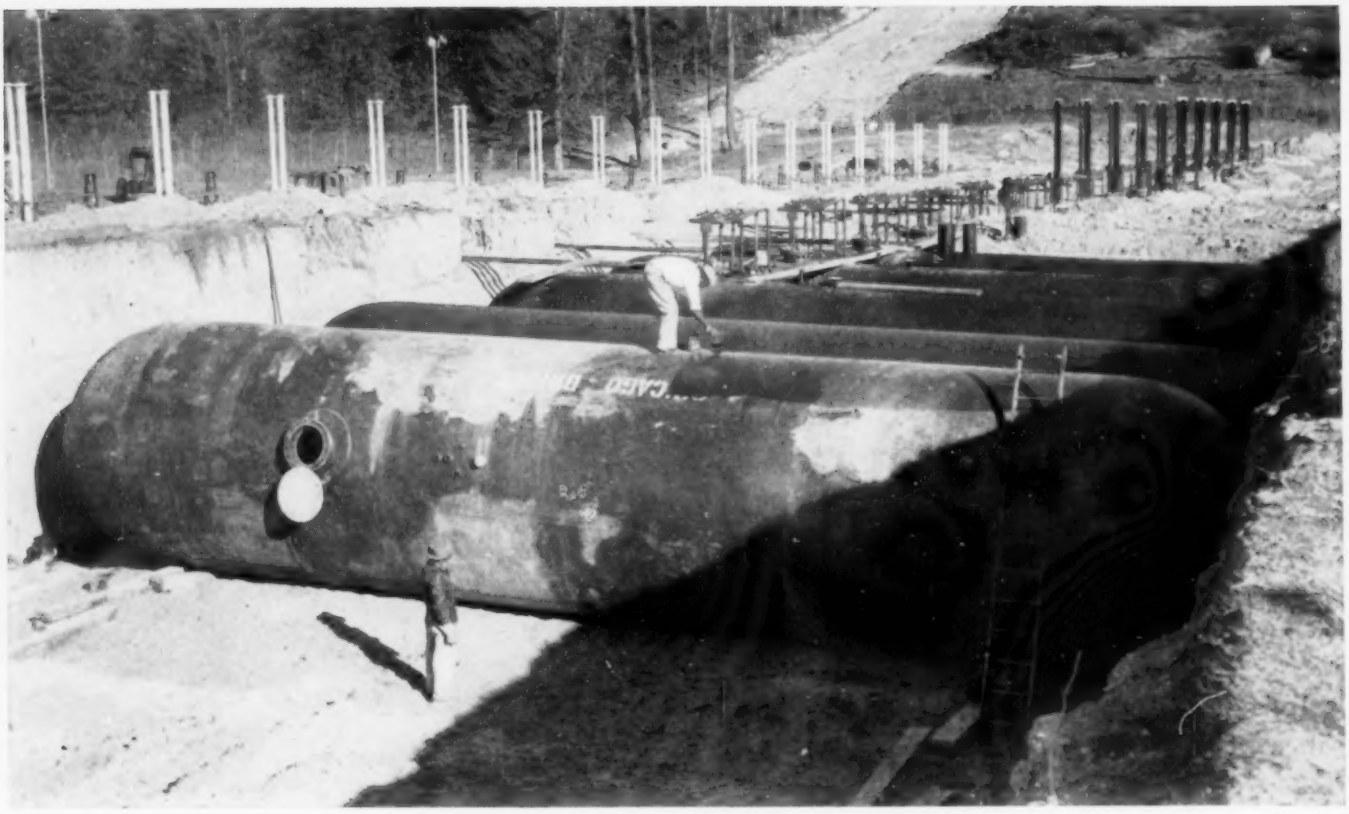

ATLANTA GAS LIGHT COMPANY INCREASES PROPANE STAND-BY

The 1956 addition to Atlanta Gas Light Company's liquid propane storage expansion program, which began two years ago, consisted of twenty 30,000 gallon tanks. The total stand-by propane-air capacity serving Atlanta became 2.7 million cubic feet per hour from 78 tanks like those pictured. The white stacks mark the location of 20 tanks installed during two preceding years. The 1957 expansion program will provide for 20 additional tanks at this plant and seven in other properties.

Underground protection of these tanks begins at the tank fabricating shop, where a special Royston inhibitive, insulating primer is applied. At the installation site the tanks are given a spray coat of Roskote Mastic. This is followed by a fog coat of non-conductive, contrast paint. The latter insures complete coverage of the second spray coat of Roskote Mastic, which completes the prescribed underground protection.

The Atlanta Gas Light Company has similar installations in Waycross, Macon, Valdosta, Rome and Athens.

If you are planning an underground or above ground installation of tanks, or piping, write for complete information on the Roskote time-proven, economical protective coating system.

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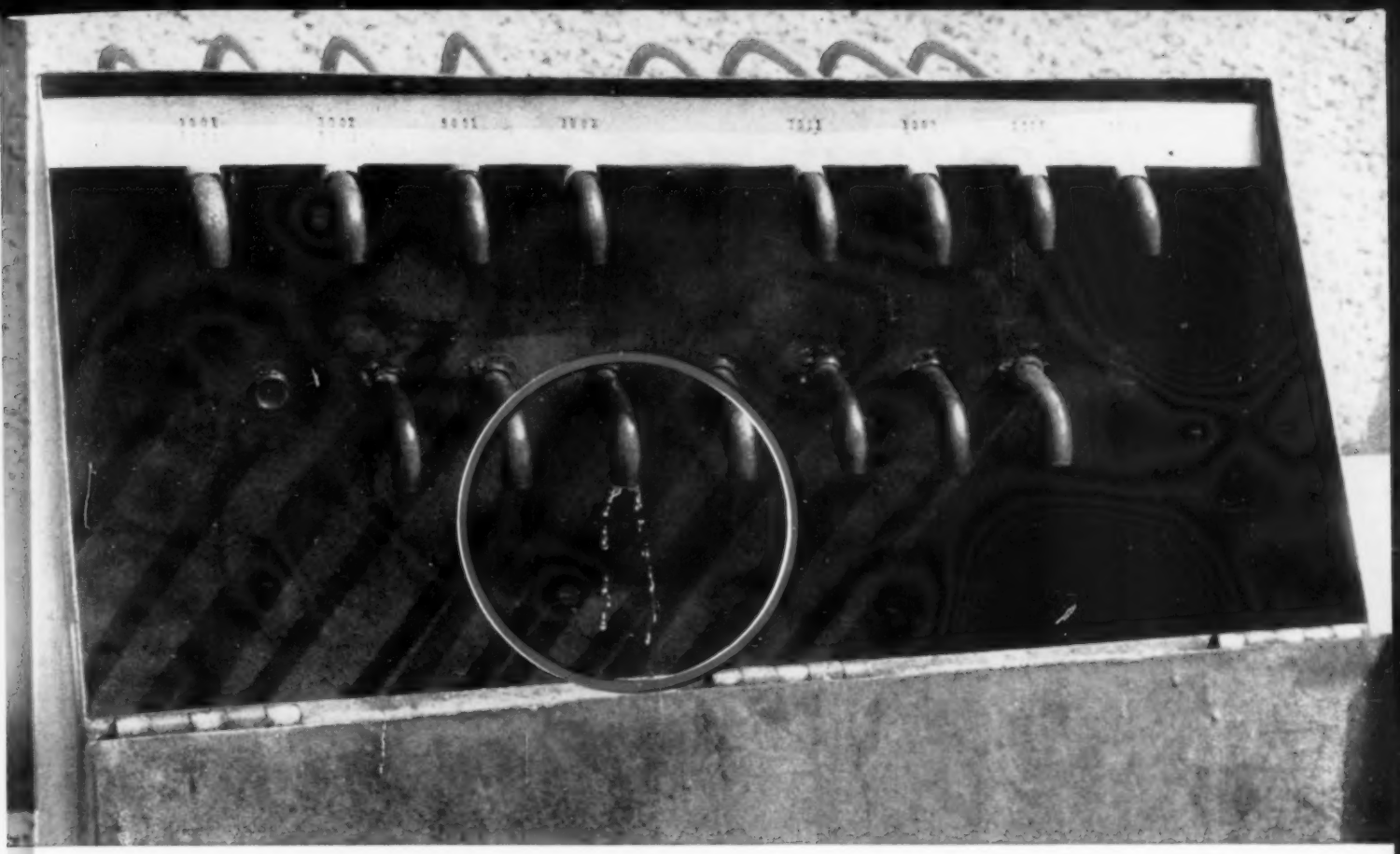

HOW TO
PREVENT VALVE LEAKAGE

The tell-tale trickle of gasoline from the one spigot above shows clearly that one valve is leaking. With most valves, this is a clear-cut signal to reseat . . . a costly, time-consuming job.

The man at the right, is reseating a valve the easy, economical way—he's lubricating a Rockwell-Nordstrom valve. The lubricant in a Rockwell-Nordstrom valve is actually a *permanent soft seat* that insures positive shut-off yet is instantly replaceable without interrupting valve service.

With the advantages you can only expect from a lubricated mechanism, it's easy to see why Rockwell-Nordstrom valves work better, stay in service longer and cost less to use. And, they cost no more to buy—often less—than ordinary valves. Available in a complete line for every pipeline need. For more information, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

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Announcing

THE NEW PIPE LINE COMPOSITE CATALOG

The publishers of PIPE LINE INDUSTRY take pleasure in announcing a new, specialized catalog service for men engaged in pipe line operations, maintenance and construction. The new publication will be a composite file of catalog data from companies selling their products or services to:

- Crude Pipe Line Companies
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- Pipe Line Contractors
- Engineering-Design-Construction Firms

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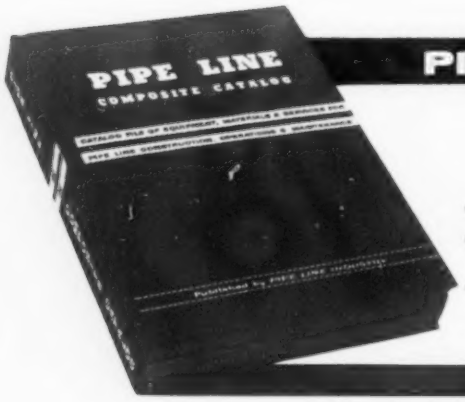
ENTHUSIASTIC INDUSTRY ACCEPTANCE

When the plan to publish this new PIPE LINE COMPOSITE CATALOG was presented to 3,500 pipe line men, they responded with overwhelming approval of the idea. More than 97% of the men answering the survey said they would prefer such a catalog, will use it and want a copy when published.

For further information concerning the new PIPE LINE COMPOSITE CATALOG, contact any of the Gulf Publishing Company offices listed below.



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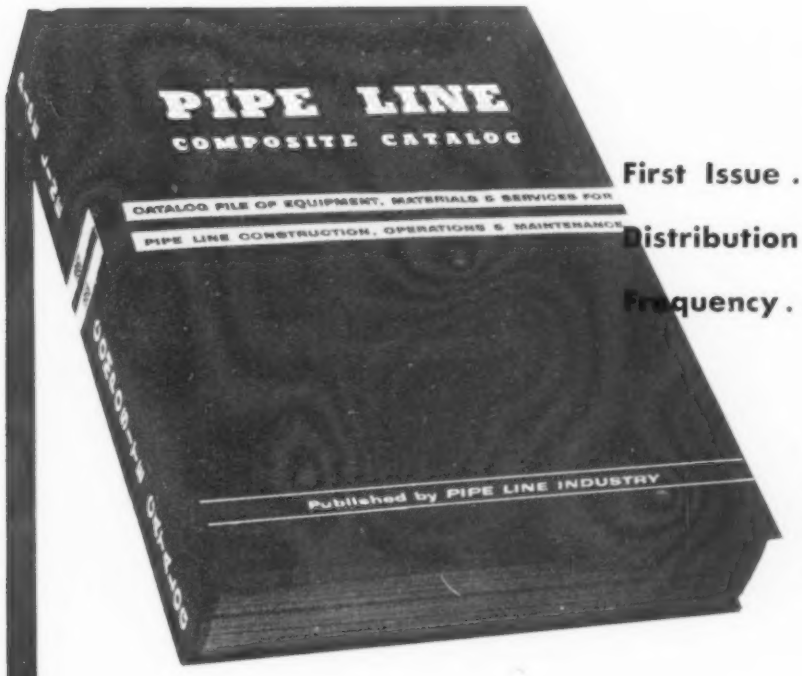
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CATALOG FILE OF EQUIPMENT, MATERIALS & SERVICES FOR
PIPE LINE CONSTRUCTION, OPERATIONS & MAINTENANCE
Published by PIPE LINE INDUSTRY

First Issue . . . . . July, 1957

Distribution 4,000

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Another Gulf Publishing Company service for the oil and gas industry.

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Full of job-help material. The Catalog will contain specifications and engineering data actually supplied by the manufacturers, service companies and suppliers serving the industry. For fast, convenient, comprehensive help in your job, make sure a copy is available to you. It will make your buying or specifying job easier.

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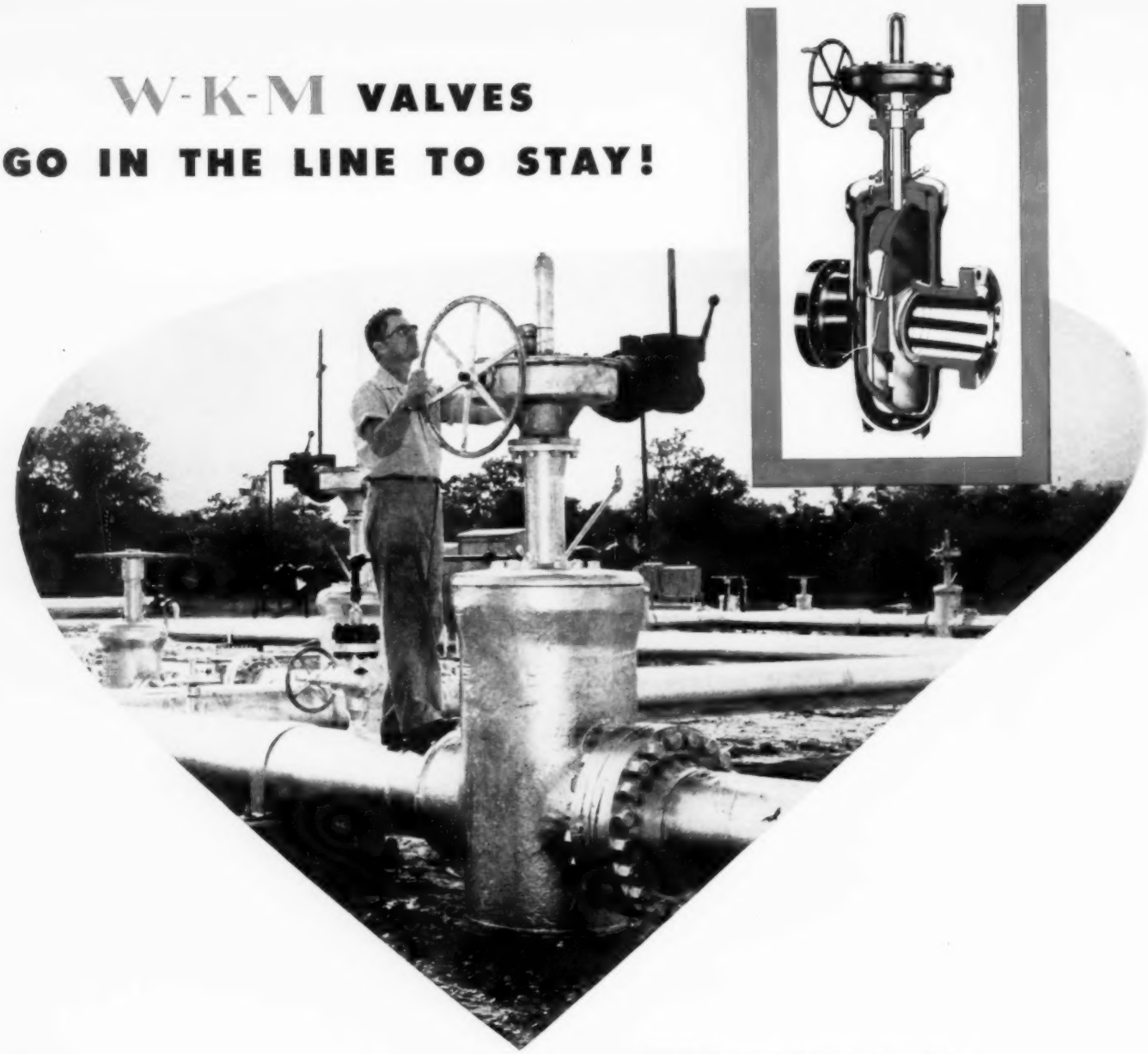
GO IN THE LINE TO STAY!



W-K-M Through-Conduit Gate Valves stay "in the line" because their superior design provides free and easy operation, positive seal under any pressure, and freedom from turbulence and destructive erosive action.

They stay "in service" when and if repairs are necessary. Gate and segment, seats, stem, bonnet, seal ring, and clamp ring can be removed and replaced without removing the valve from the line.

For valves that stay in service and in the line year after year, specify **W-K-M** Through-Conduit Gate Valves.

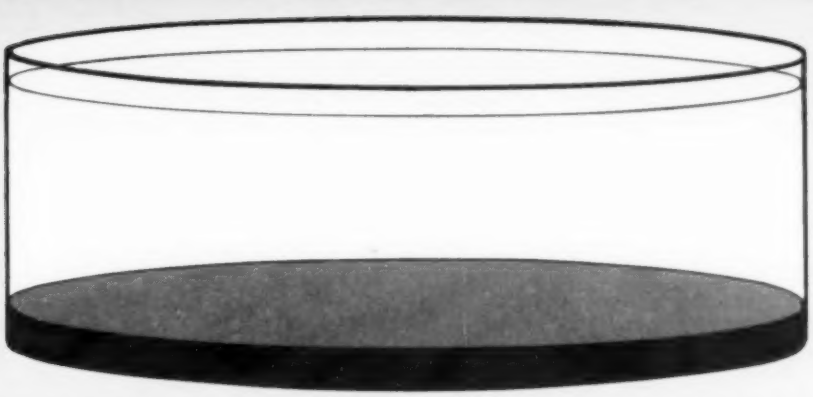
W-K-M ASA Through-Conduit Valves are available in sizes 2″ through 30″—ASA 300 lbs. to ASA 900 lbs. Valves up to 12″ are available through Supply Stores.

W-K-M
DIVISION OF acf INDUSTRIES INCORPORATED
PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

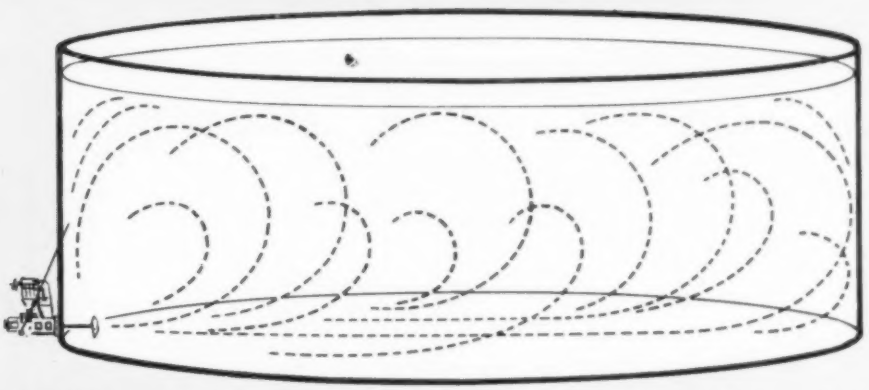
5702

Bring your valve reference library up to date by writing Dept. J-7 for new W-K-M ASA Through-Conduit Gate Valve Catalog 300.

MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS



THE EXPENSIVE WAY—If you let sludge pile up in your tank bottoms, you're probably paying much more than you realize for sludge control. Actual tank cleaning cost is only part of the story.



THE LIGHTNIN WAY—You actually save money when you keep tanks free of sludge the easy way, by flipping a switch. Read why LIGHTNIN control of BS&W may save you as much as $1,000 per tank per year.

How do you control SLUDGE?

You can make a one-time investment that will eliminate *for good* the expense and mess of cleaning out sludge in your crude oil tanks.

Just take the money you plan to spend for sludge cleanout in the next year—and invest it in LIGHTNIN Mixers.

How much can this save you on overall operating cost? Careful field tests, by a large pipe line company, show a direct, traceable saving of *$1,000 per tank per year.*

Why you save 3 ways

1. Every time you have to clean out a tank, you spend just about enough to cover the cost of a LIGHTNIN Mixer. With a LIGHTNIN in the tank, you can keep sludge suspended in the crude, or resuspend it if it has settled. You can maintain as little as *one inch* of sludge level in the tank bottom, year after year.

2. You can keep full holding capacity of your tankage ready to use when you need it. No downtime for cleaning out sludge—no sludge pile-up to waste tank capacity. Add as much as *12% more capacity* without adding a single tank.

3. You realize *full value* on the crude you handle. Crude leaving the tank contains the same values as when it entered the tank. With LIGHTNIN Mixers, you can make every barrel in the tank merchantable crude oil.

To get these savings, more than 50 independent pipe line companies and 35 leading producers and refiners use LIGHTNIN Mixers for crude oil sediment control.

What can you save?

Want specifics on what *you'll* save with LIGHTNINs in your tanks? Your LIGHTNIN Mixer representative can give them to you. For quick, competent help, phone him today. (He's listed in your copy of Composite Catalog.) Or write us direct.

Lightnin® Mixers

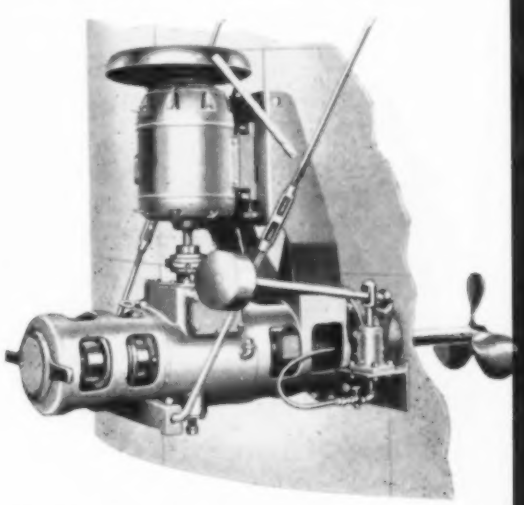
MIXCO fluid mixing specialists

Get *these helpful bulletins* on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

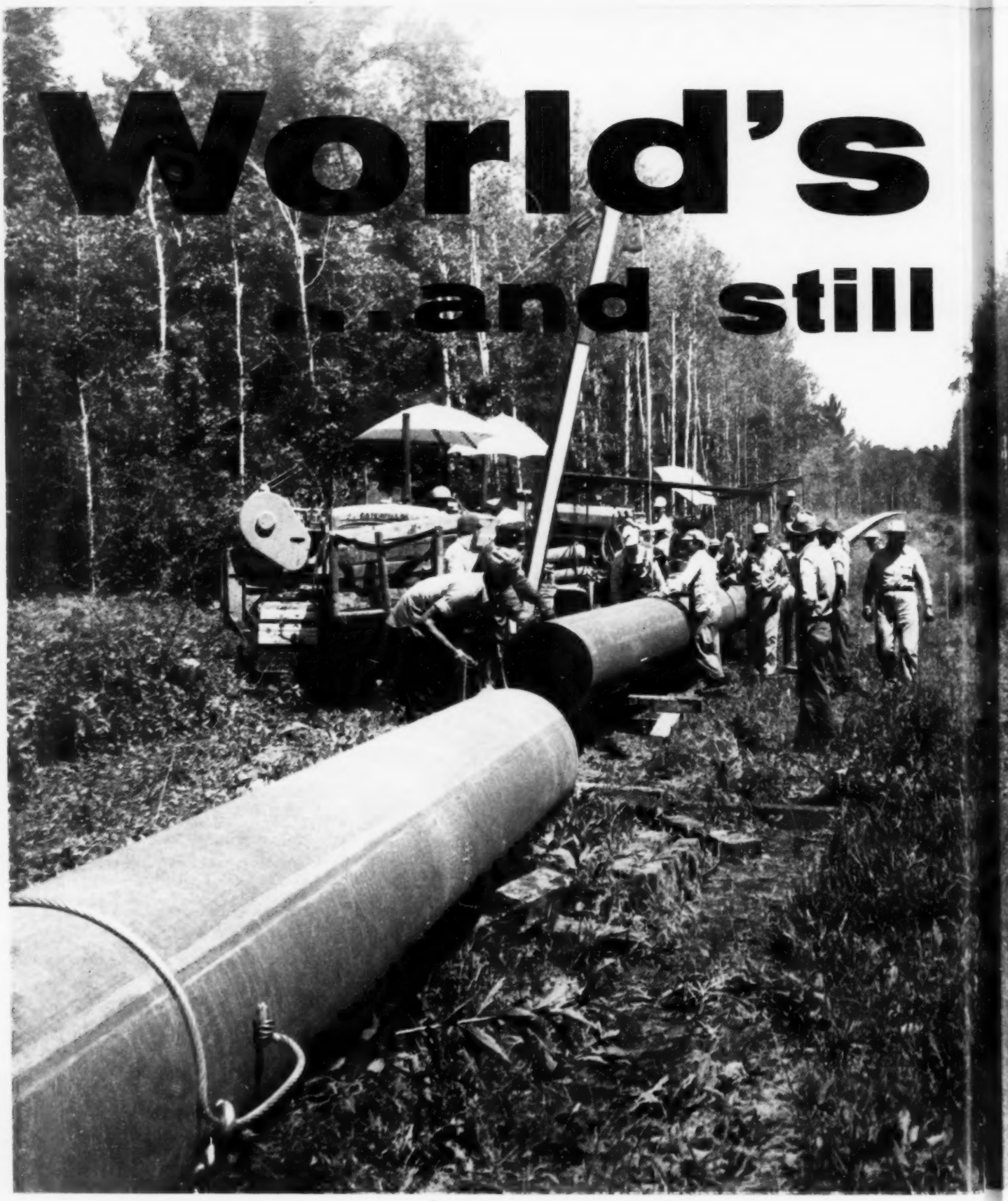
- ☐ B-503 BS&W Control with LIGHTNIN Mixers
- ☐ B-104 Side entering mixers, 1 to 25 HP
- ☐ B-107 Data sheet for figuring mixer requirements
- ☐ B-109 Condensed catalog describing LIGHTNIN Mixers—all types
- ☐ B-111 LIGHTNIN rotary mechanical seals for extra-low-cost mixing

MIXING EQUIPMENT Co., Inc., 196-g **Mt. Read Blvd., Rochester 11, N.Y.**

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.



YOU CAN GET LIGHTNIN Mixers in sizes from 1 to 25 HP, to control bottom sediment in any tank, regardless of tank capacity.



Interprovincial has extended their system from Superior to Sarnia and now from Sarnia to Port Credit, Ontario by the end of this year. It will then include over 3,000 miles of main line and loops. A. O. Smith's contribution to the system will be just above 50% of the total line laid.

longest growing!

Interprovincial Pipe Line Company has 1,774 miles of main line now in service . . . will extend this system another 156 miles during '57

THIS is the big crude oil carrier from Edmonton, Alberta, to refineries in the Prairie Provinces and Ontario in Canada . . . Minnesota, Wisconsin and Michigan in the U. S. Spanning 1,774 miles, it's already the world's longest line of this type and construction is now under way that will increase main line length to over 1,900 miles.

A. O. Smith is proud to have been a part of this great system since the original main line of 1129 miles was constructed in 1950. Over 70% of this original line to Superior, Wisconsin was supplied by A. O. Smith. Since that time from both Milwaukee and Houston mills, A. O. Smith has supplied most of the pipe for the looping work done on this original section in 1953, 1954, 1956 and 1957.

Map shows the complete system of main and looping lines as it will be when this year's construction is completed.

On the current project, A. O. Smith is supplying pipe for the looping lines being built near Glenavon and between Clearbrook and Superior.

For almost 30 years...

A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely-controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

Through research A.O. Smith *. . . a better way*

A.O.Smith
CORPORATION

TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 17 • Midland 5, Texas • New Orleans 12 • New York 17 • San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D. C.
International Division: Milwaukee 1, Wisconsin

Truly-- more for your money!

- √ *Higher Venting Capacity*
- √ *More Accessible*
- √ *Lighter Weight*
- √ *Very Compact*
- √ *Greater Value*

The new S. & J. low pressure breather valve, Model ST-9749, recently introduced, incorporates new values which place it head and shoulders over previous comparable models.

Soon to be available in a complete range of sizes, from 4" through 12", the new design retains the diaphragm type seal and thermosetting phenolic seats pioneered by S. & J., and in addition provides greater safety, lighter weight, increased flow capacities, tighter seal below set operating values, and other features which will keep this breather in the vanguard for a long time to come.

S. & J. Engineers in all of the branch offices below, have transparent models of this new valve available, so that you can see its method of operation right on your own desk. Telephone the office nearest you and ask to see the model of this extraordinary new breather. Specification sheets and prices on request.

S&J

SHAND AND JURS CO.

A SUBSIDIARY OF

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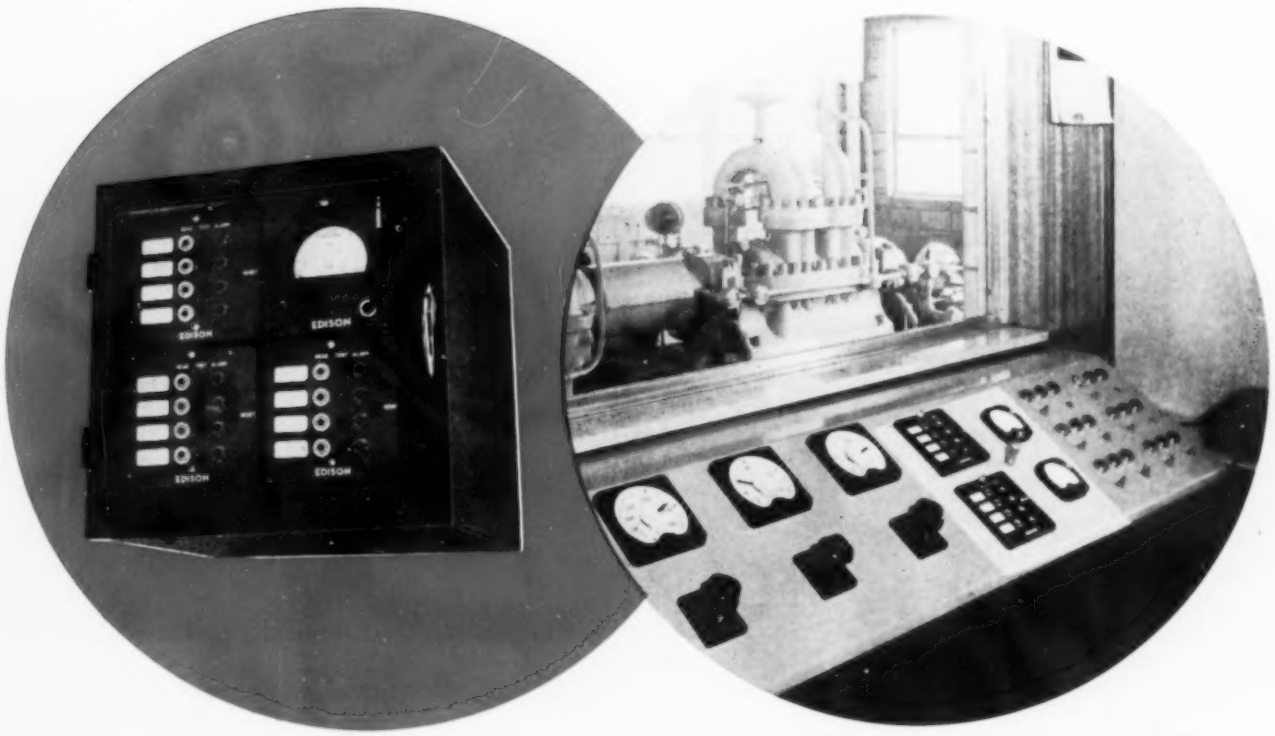
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CALGARY: P. D. McLaren & Son, Ltd., 510 - 9th Ave. W.
MEXICO, D.F.: Dalmo Comercial, S. A.
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

HOW EDISON'S OMNIGUARD PREVENTS PUMPING STATION SHUTDOWN FOR SUN OIL

Booster station shutdowns are prohibitively expensive. At the Sun Oil Company's pumping station at Rochester, Michigan, crude oil is pumped 24 hours a day, 7 days a week from Toledo, Ohio to Canada. One motor or pump shutdown would cost Sun Oil thousands of dollars in both maintenance and production costs.

The Edison Omniguard is used by Sun Oil for alarm and control purposes in connection with the operation of two major pieces of equipment — a 500 hp motor and a 6 stage centrifugal pump. Seven points are under constant surveillance by the Omniguard apparatus; namely, the two motor bearings, the two pump bearings, the two pump seals, and the pump case.

The alarm system at each point is pre-set for a given temperature, automatically warning the operator of any rise in temperature beyond the pre-set point and simultaneously shutting down the unit to prevent damage to major equipment in the pump station. All Omniguard temperature controls are located in a desk type console installed in the control room.



The following Omniguard features prompted Sun engineers to specify it for the Oakland installation:

1) Fast response
2) Quick adjustment of pre-set points
3) Ability to alarm and/or shut down selected points
4) Small physical dimensions of the sensing element
5) Explosion-proof construction at sensing element
6) Associated equipment can be installed immediately

Write for more technical details to:

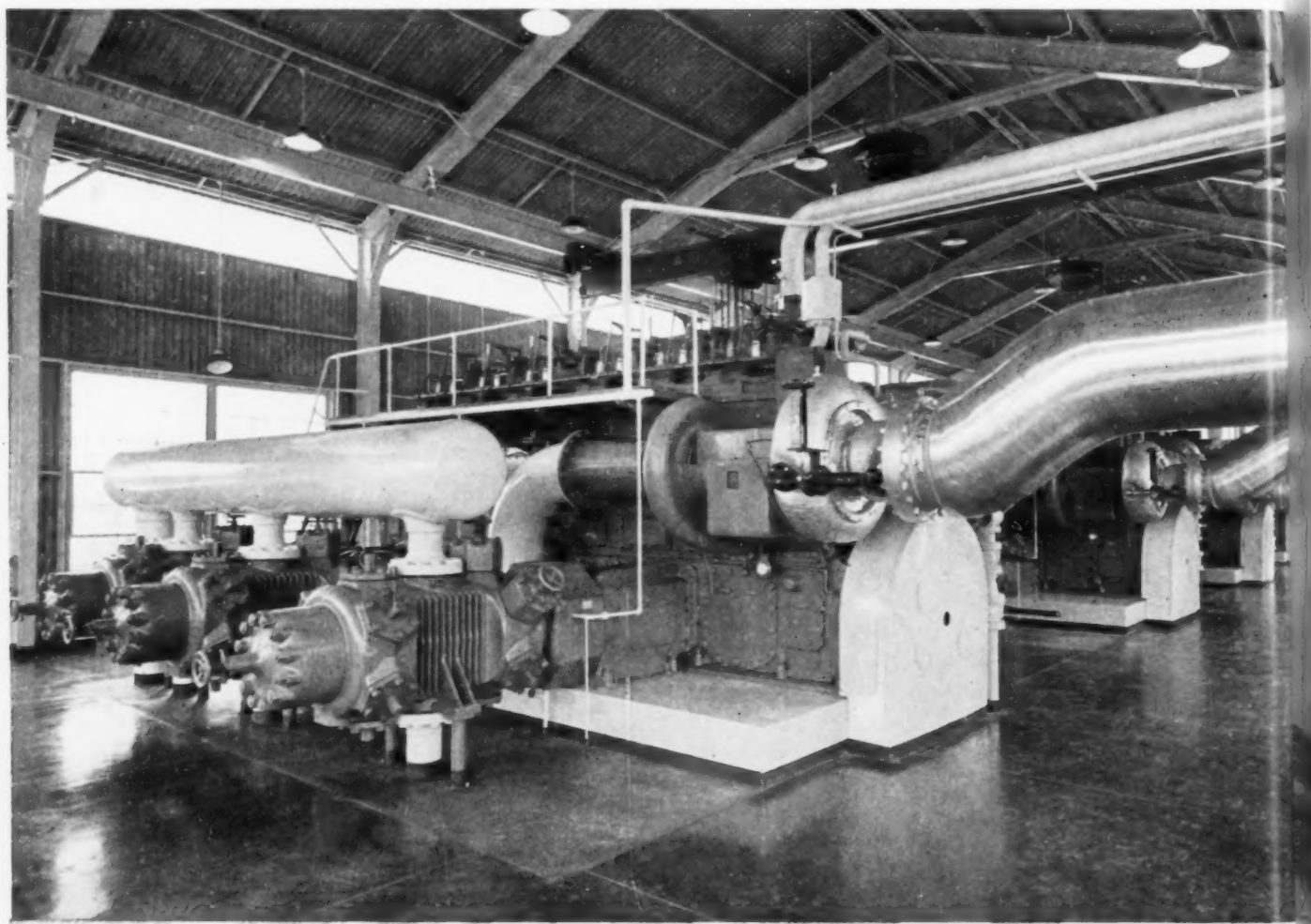
McGRAW EDISON

Thomas A. Edison
INDUSTRIES
INSTRUMENT DIVISION
95 LAKESIDE AVENUE
WEST ORANGE, N. J.

For Pacific Northwest's...

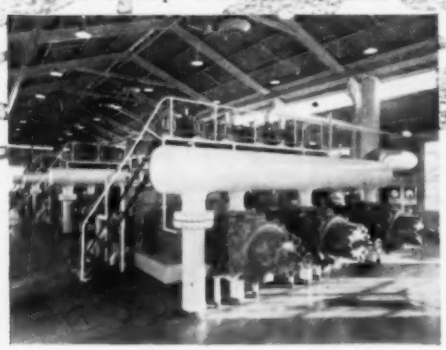
Altitude: 6600'

Station-1. Ignacio, Colorado
Six—2000 bhp. Clark TLA-6 Turbo-supercharged Compressors



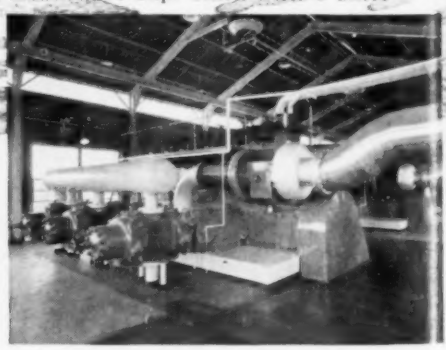
Altitude: 5620'

Station-2. Moab, Utah
Four—2000 bhp. Clark TLA-6 units



Altitude: 6000'

Station-4. Rangely, Colorado
Four—2000 bhp. Clark TLA-6 units



Mile high pipeline

46,000 BHP. of Clark Turbo-supercharged Compressors Furnish Over Half the Main Line Horsepower

Some of the most rugged terrain in the country is covered by Pacific Northwest's 1500 mile pipeline serving the northwestern part of the United States. Twenty-three Clark 2000 bhp. TLA-6 turbo-supercharged compressors supplied over half of the main line horsepower.

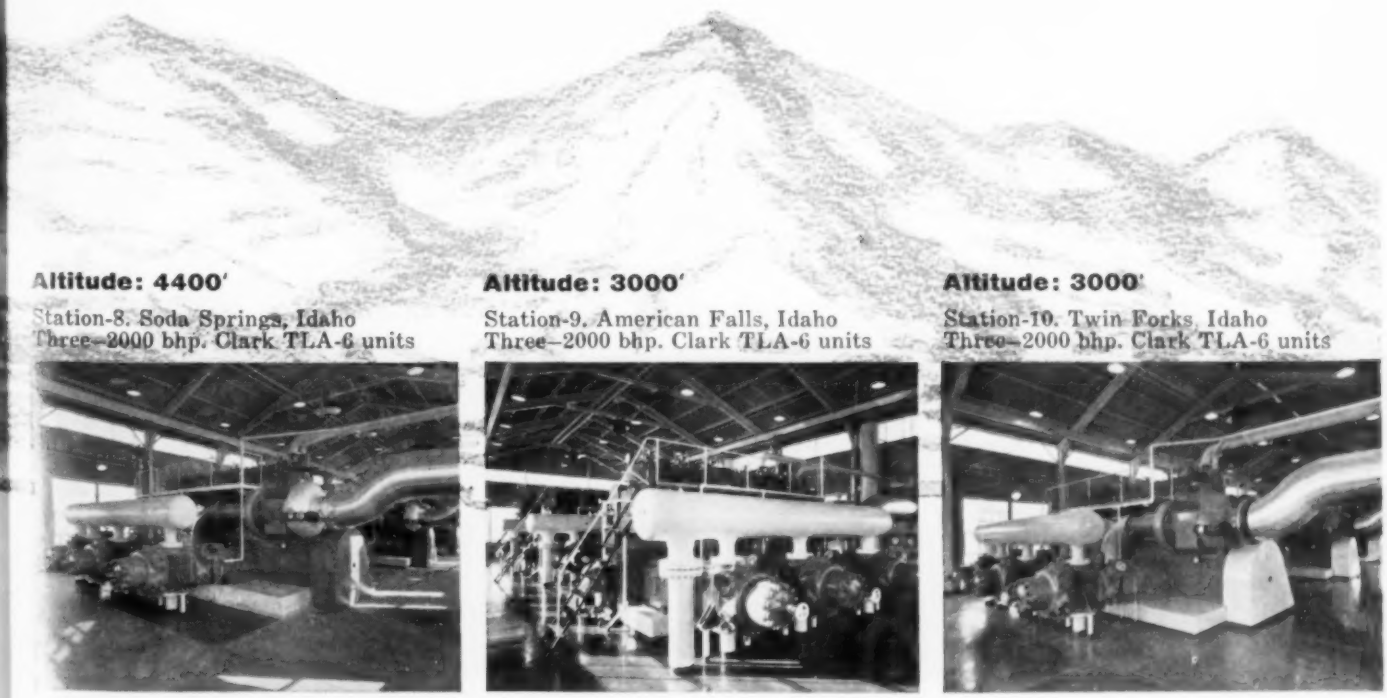
With stations operating at elevations of up to 6600′, normally aspirated engines would have required heavy deration. The Clark TLA-6 units, however, operate with substantially less deration because they are turbo-supercharged. (Clark can now supply for its TLA units, as optional equipment, a special turbocharger for high altitude applications which permits sea level ratings. No deration is required.)

Mountain top locations or "down in the flats", the modern Clark turbo-supercharged compressor is the most economical prime mover to install on today's pipelines. They are built in seven sizes ranging from 1100 to 3400 bhp. Your nearest Clark representative will be pleased to give you complete information.

CLARK BROS. CO., OLEAN, NEW YORK
One of the Dresser Industries
Offices in Principal Cities Throughout the World

CLARK®

Turbo-supercharged Compressors

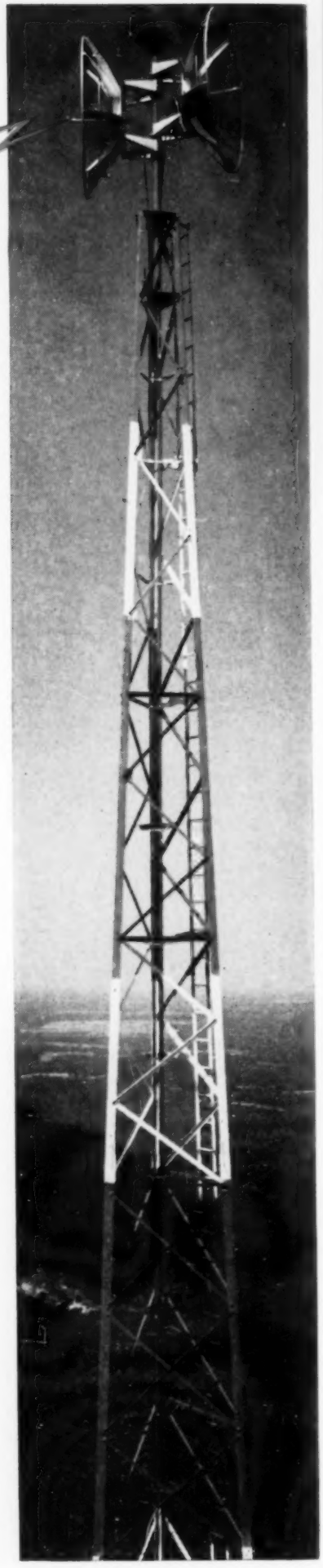


Altitude: 4400′
Station-8. Soda Springs, Idaho
Three–2000 bhp. Clark TLA-6 units

Altitude: 3000′
Station-9. American Falls, Idaho
Three–2000 bhp. Clark TLA-6 units

Altitude: 3000′
Station-10. Twin Forks, Idaho
Three–2000 bhp. Clark TLA-6 units

NOTE: All horsepower ratings are based on sea level elevation.



For your vital control communications

DEPEND ON MICROWAVE

. . . by Westinghouse

Your pipeline operation is as efficient—and profitable—as its control communications system.

That simple fact emphasizes the importance of a properly designed system to insure unfailing reliability and flexibility for future growth.

Westinghouse fills the bill by providing the ultimate in circuit simplicity designed specifically for ease of maintenance and interchangeability. Multiplex panels allow up to 30 crystal-controlled channels capable of carrying up to 15 sub-channels for telegraph, teletype, telemetering or supervisory control. Westinghouse system design incorporates automatic alarm and *100% stand-by* for interruption-free service. Above all, Microwave gets through, without wires subject to weather or accident damage.

Get all the details—and the economic advantages—from your nearby Westinghouse sales office—or write to Westinghouse Electric Corp., Carrier-Microwave Department, Box 7425, Halethorpe 27, Md.

J-60908

YOU CAN BE SURE...IF IT'S

Westinghouse

makes precision lapping
a simple, low-cost tool
for all industry!

BYRON JACKSON'S *all-new*

LAP-KING

Here, for the first time, is a precision lapping machine that is fool proof. Any mechanic can operate this bench-type machine and produce lapping accuracy to 11.6 millionths of an inch. Quality control is easily maintained because the BJ Lap-King is specially designed to relap its own plates, one against the other, after a normal job run. This assures consistent optically-flat lapping plates for automatic accuracy of lapped work. The hour meter records the exact amount of lapping time on each plate. An automatic timer provides job time control.

Lap-King is ideal for mechanical seal refacing for refineries, pipelines, power plants, etc. and for any repair work and small production runs in industry where lapping precision is desired.

SPECIFICATIONS

Width	15"
Depth	14½"
Height of case	12"
Height to top of Star Nuts	16⅜"
Motor	¼ HP 110 volt
Dia. of lapping plates	9"
Net weight	165 lbs.
Shipping weight	220 lbs.

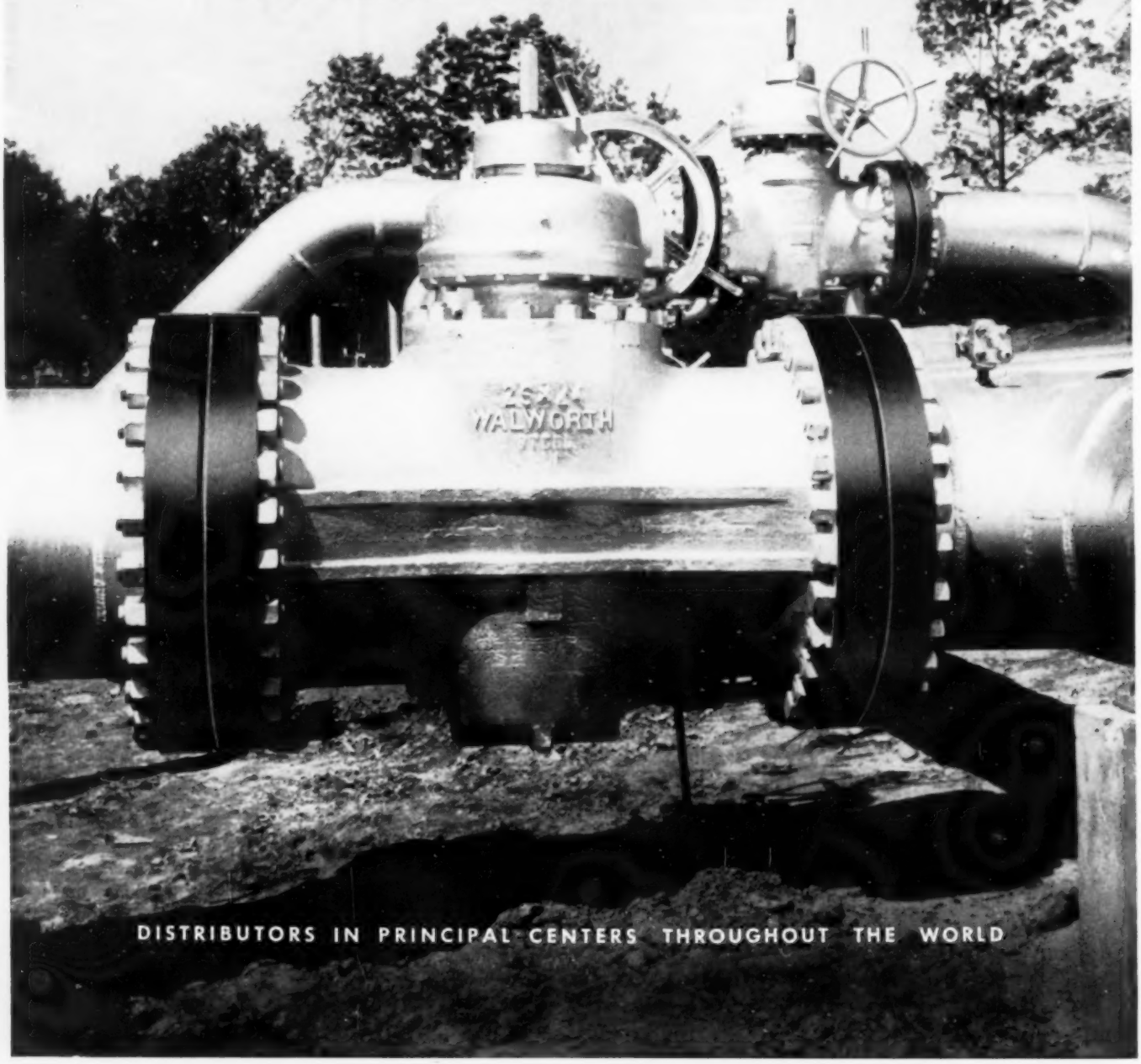
Contact your nearest Byron Jackson sales engineer or write to:

BYRON JACKSON PUMPS
INCORPORATED
A subsidiary of Borg-Warner Corporation
P. O. Box 2017A, Terminal Annex
Los Angeles 54, California

LUBRICATED PLUG VALVES by WALWORTH

Two Walworth Cast Steel Lubricated Plug Valves in use on the main line of a southeastern gas pipeline.

In addition to Lubricated Plug Valves, Walworth manufactures Gate, Globe, Angle, and Check Valves in a wide range of types and sizes for the oil and gas industries. Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

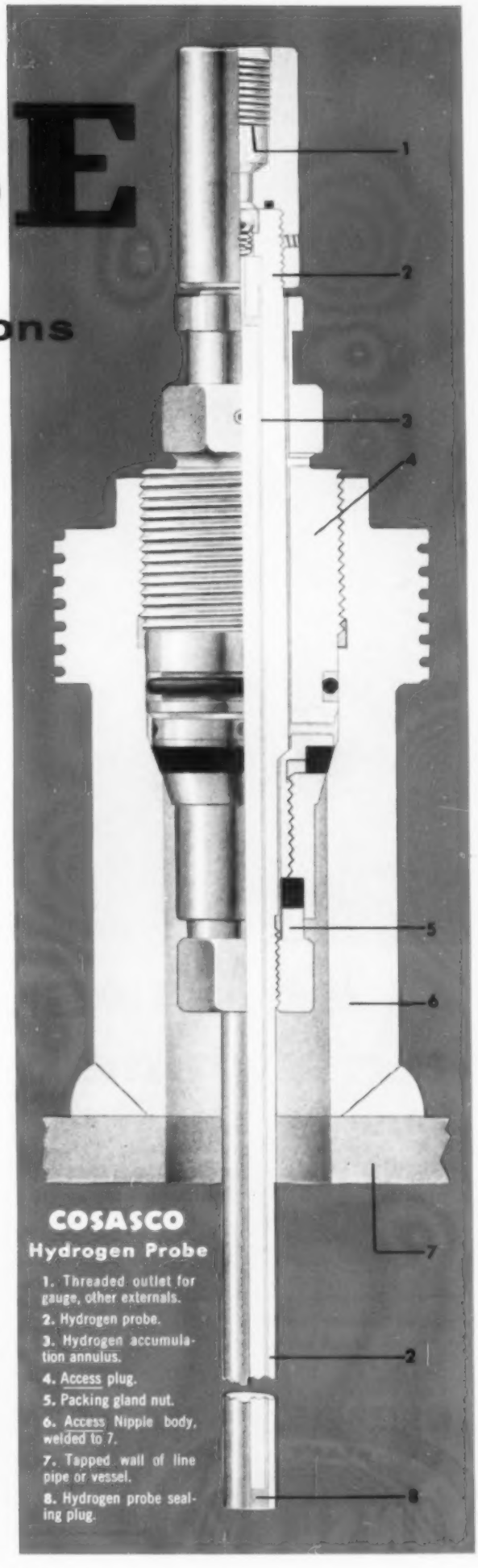
PROBE

for atomic hydrogen under operating conditions

CORROSION CONTROL programs that require data on hydrogen diffusion in pipe-line or vessel walls will find the COSASCO Hydrogen Probe a valuable tool. Since it is installed through a COSASCO *Access* Nipple, it can easily be inserted or withdrawn at any time while vessel or line is on stream. It can be used to detect presence of free atomic hydrogen and to gauge rate of hydrogen diffusion by calibrating pressure rise within the hydrogen accumulation annulus.

The Hydrogen Probe is but one of the specialized COSASCO *Access* Plugs available for obtaining corrosion rate, cause and correction data. With them, corrosion coupons, water samplers, and thermocouples may be placed in transmission, storage, recovery or processing equipment without requiring shutdown because of pressures encountered.

COSASCO Access Nipples, through which entry is obtained, also permit important reductions in valve and other external equipment investments for wellheads, pipe lines and vessels. In addition, they increase safety ...now proved in industry-wide installations.



Is Operating Pressure Keeping You Out?

If you have an entry-against-pressure problem, COSASCO engineers can help you overcome it. Send details and blueprints depicting your problem and the COSASCO solution will be supplied promptly and without any cost to you whatsoever. *Write directly to COSASCO* Division of Perfect Circle Corporation, at the address below.

Protect equipment...Save product

COSASCO

DIVISION OF PERFECT CIRCLE CORPORATION

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Export Office: 3631 Atlantic Avenue, Long Beach 7, California

For more data on advertised products, use Readers' Service Cards, last page.

the INSLEY "pipeliner"
...a machine built for pipeline wor

The Insley "Pipeliner" is the hard-working answer to the contractor's need for a machine especially designed for pipeline work . . . a machine with "built-in" durability and stamina that wil withstand the severe operating conditions of cross-country pipelining.

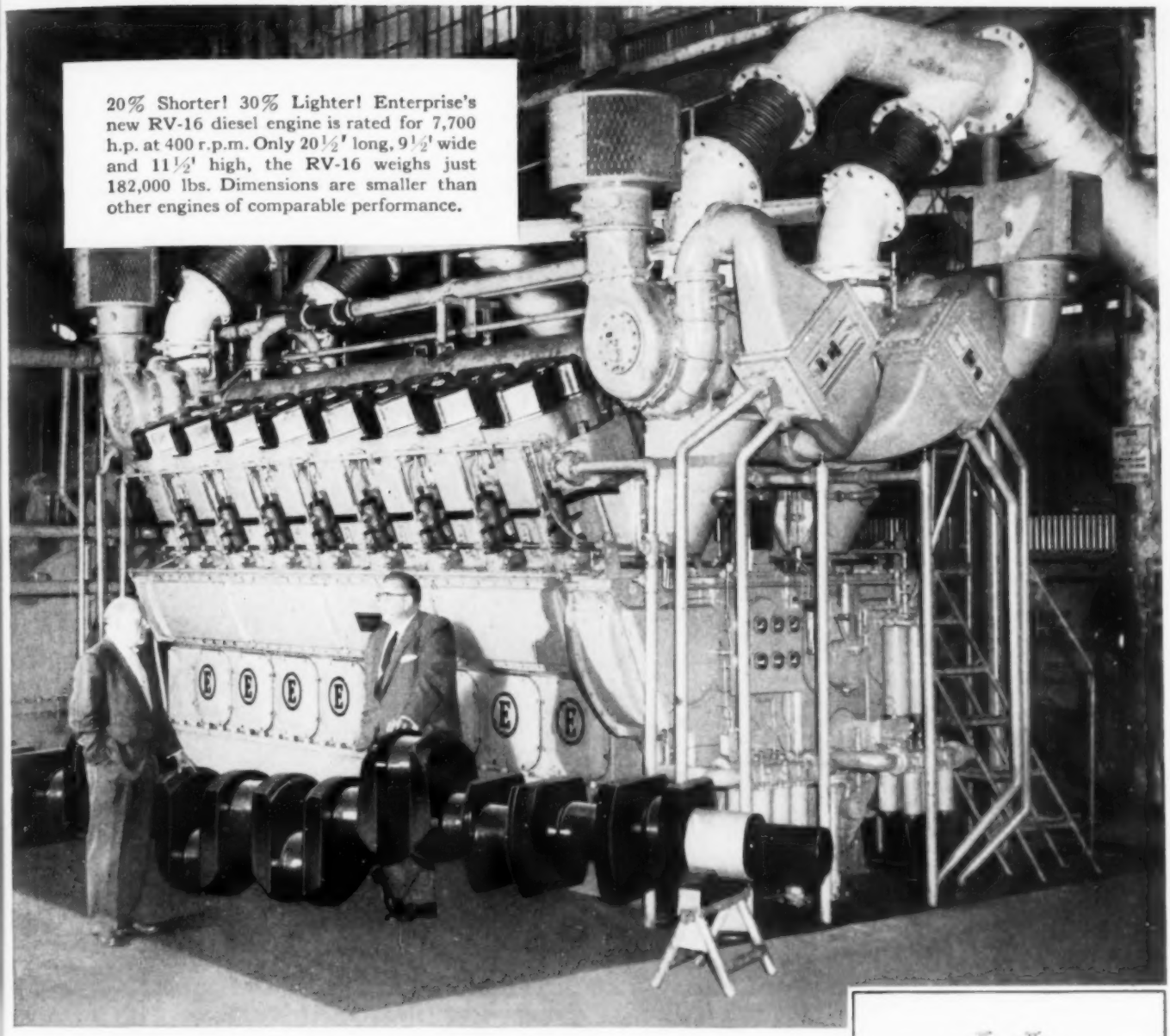
- **Wide, deep carbody with removable bottom cover plates**
- **Crawler rollers and tumblers sealed against dirt**
- **Two-speed travel (optional) through two-speed transmission .8 M.P.H. and 1.6 M.P.H.**
- **Increased stability and flotation with 12'-6" crawlers and 24" or 30" shoes**
- **Long wearing, heat-treated, alloy steel crawler shoes and pins**

The "Pipeliner" is fully convertible for hoe, shovel, dragline, clamshell and crane work, and is available with gasoline or diesel power. See your Insley distributor for full details or write direct to Insley.

Let Your Insley Distributor Show You an Insley at Work

THERE'S AN INSLEY WORKING NEAR YOU

INSLEY MANUFACTURING CORPORATION
INDIANAPOLIS, INDIANA



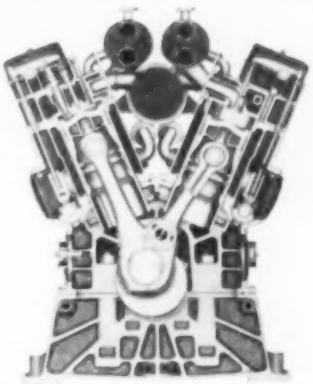
20% Shorter! 30% Lighter! Enterprise's new RV-16 diesel engine is rated for 7,700 h.p. at 400 r.p.m. Only 20½' long, 9½' wide and 11½' high, the RV-16 weighs just 182,000 lbs. Dimensions are smaller than other engines of comparable performance.

Enterprise Chooses KOPPERS Piston Rings Exclusively for RV-16

Prototype of a new line of industrial diesel engines, the RV-16, built by Enterprise Engine & Machinery Co., of San Francisco, is designed for such rugged operations as delivering main propulsion in towboats and seagoing freighters, or supplying power for pumping stations or electric generation.

As many other leading manufacturers have done, Enterprise has selected Koppers Piston Rings exclusively. Koppers wide range of types and sizes . . . variety of material selection . . . control of material quality . . . close tolerance performance . . . rigid standards of inspection—all contribute to Koppers leadership in the field of industrial piston and sealing rings, making Koppers the most dependable source of supply.

If you have a problem of ring application, avoid further needless expense. Take advantage of Koppers experience, research facilities and craftsmanship. Write for information today. KOPPERS COMPANY, INC., Piston Ring and Seal Department, 7207 Hamburg Street, Baltimore 3, Maryland.



Cutaway shows internal design of the RV-16

KOPPERS

AMERICAN HAMMERED

Industrial Piston Rings

Engineered Products Sold with **Service**

Why Lower-Groove Compression Rings Need Supplementary Pressure

Pedrick Formflex Seal-Cut Conformable Compression Ring

The force or pressure of the compression and combustion gases back of the rings is one of the most important factors in keeping the compression rings pressing against the cylinder walls for a satisfactory seal. The tension built into the ring contributes to this, but in a relatively minor way.

The top compression ring enjoys the greatest assist from combustion-chamber pressures. The gas pressure available to the second ring is only what passes through the top-ring gap, and is substantially less than cylinder pressure. The pressure behind the 3rd ring is still further reduced. Thus, by the time the gas pressures reach the lowest compression ring usually there is not sufficient force to enable the ring to maintain a seal, and it is here that it is most important to maintain a seal to prevent the gases from going further.

The ring used in the lowest compression groove needs special assistance to do its job. This is provided in the Pedrick FORMFLEX Seal-Cut compression ring. It is a single cast-iron ring of much less radial thickness for greater conformability and response to pressures. Its special-design of overlapping ends close the gap completely. Its big assistance comes from the Pedrick "Equalizer" which backs it up and provides adequate additional outward pressure to seal at the cylinder wall and stop blowby. This pressure is exerted everywhere around the ring and is absolutely uniform.

The result is a ring conformable enough to follow cylinder-wall irregularities and with enough pressure to maintain an effective seal. Power is preserved. Contamination of the lubrication oil from blowby gases is avoided. There is no build-up of undesirable and potentially-dangerous gas pressures in the crankcase.

Why not get the full benefit of Pedrick's experience in the design and application of conformable compression, as well as conformable oil rings, to your big diesel and natural-gas engines? For engineering details on the application of conformable compression rings, write for Form 434. WILKENING MANUFACTURING CO., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

THE day you begin coating and laying your pipeline is the day you write your own ticket on future maintenance costs.

You can save a few first-cost coating dollars by using "economy" materials—and then watch those savings go down the drain within a few years in the cost of excessive cathodic protection and maintenance. Or you can coat with performance-proven coal tar enamels and enjoy minimum maintenance costs, year in and year out.

On line after line, in all kinds of terrain and soil, tough, durable Pitt Chem Coal Tar Enamels have *proved* their superior ability to resist soil stress and water absorption, the two pitfalls of "economy" coatings. That's the kind of protection that pipeline companies specify for maximum insurance against high maintenance costs. For Pitt Chem Enamels are *quality-guaranteed* by strict, *written* specifications, thorough production control and quality raw materials.

We will welcome the opportunity to discuss your pipeline protection problems with you.

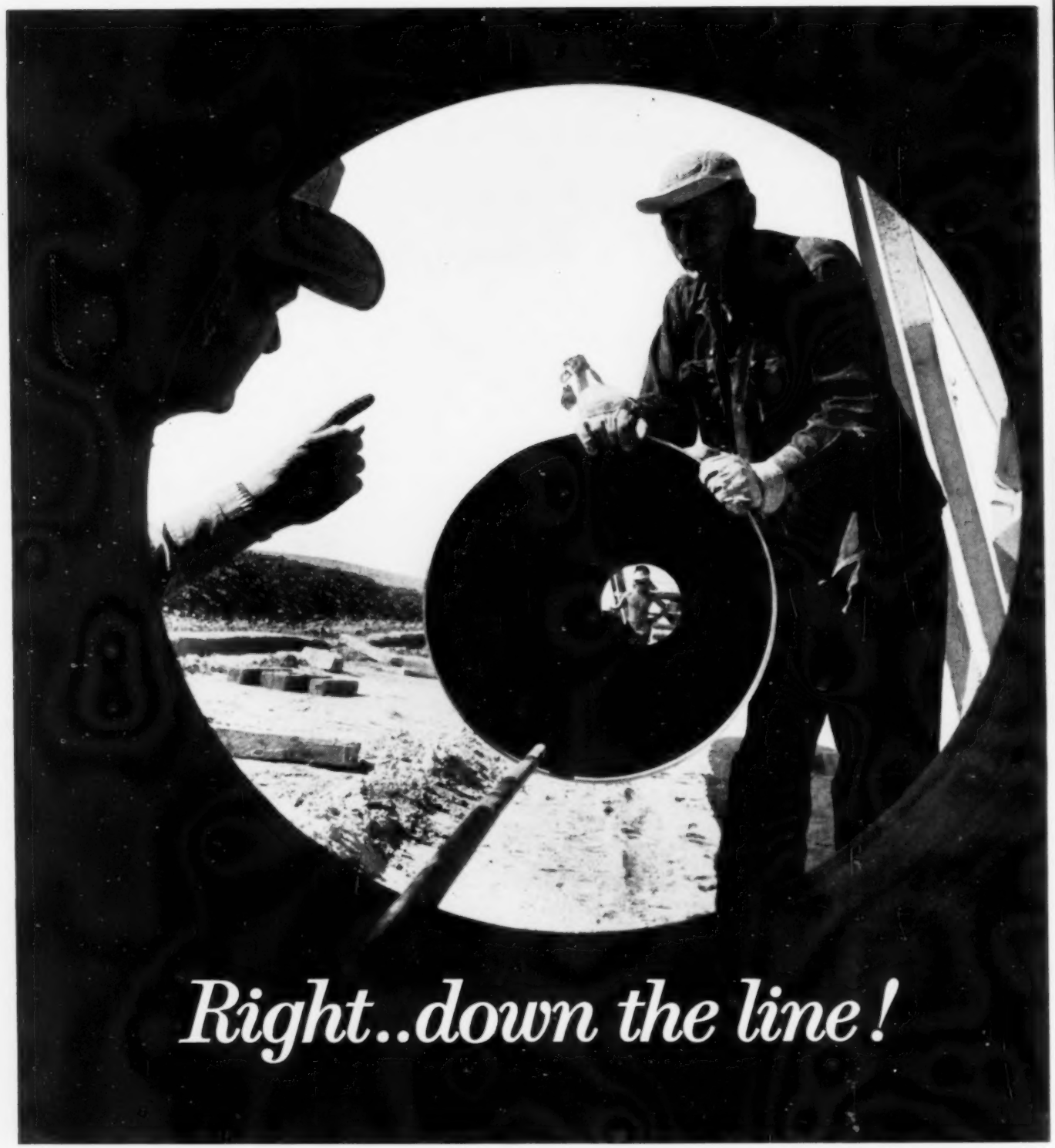
PITT CHEM® TAR BASE ENAMELS

Standard Grade Modified Grade
Plasticized Grade Hotline
Cold Applied Tar Base Coatings

PROTECTIVE COATINGS DIVISION
PITTSBURGH COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

WSW 6396

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



PACIFIC NORTHWEST PIPELINE CORPORATION PHOTOGRAPH.

Quality, uniformity, precision—these are watchwords that you can always depend on when you use Kaiser Steel Line Pipe.

For example, Kaiser Steel Line Pipe—20 inch OD and larger—is placed in restraining dies and expanded by water under great pressure. This hydraulic expansion assures accurate diameter, concentricity and straightness—and also strengthens the pipe through additional cold working. Another example of the painstaking care that goes into the manufacture of pipe from Kaiser Steel.

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe. Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes • semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe • reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

Anaconda Type CP Cable being buried on cathodic protection job. Special covering resists almost every soil condition you're likely to meet.

Special cathodic protection cable gives you longer cable life even in "problem soils"

Soils vary. One may be acidic. The next alkaline. One dry. Another wet.

Now Anaconda offers you a special Type CP cable that gives you the very best performance under all these conditions—under *any* condition you're likely to meet.

This cable is *especially* designed for cathodic protection. Its plastic covering resists electro-endosmosis, oil, moisture, and most acids, alkalies and chemicals found in corrosive soil areas. It's rugged, too. Resists abrasion and weathering.

Its greater dependability means fewer repairs . . . lower operating costs.

For full information, call the Man from Anaconda. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 57388

ASK THE MAN FROM **ANACONDA®**
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Youngstown's "big 5"

HELP SOLVE YOUR OIL OR GAS LINE PROBLEMS, WHEREVER YOU ARE

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

It's no secret that installation crews prefer Youngstown Electric Weld Line Pipe for its easy line-up qualities. Good line-up is a direct result of the extra care that goes into its manufacture. To achieve the optimum in roundness, each length of Youngstown Pipe is placed in an hydrostatic expander, here, internal water pressure forces the pipe out against the solid steel walls of the mantle. The diameter of the pipe is thereby increased to a uniformly accurate size. Every length conforms to specifications—ends are truly round, uniform in wall thickness, squarely cut and properly beveled for welding. These excellent line-up characteristics are more evidence that it pays to specify Youngstown Electric Weld line pipe.

Youngstown Electric Weld Line Pipe

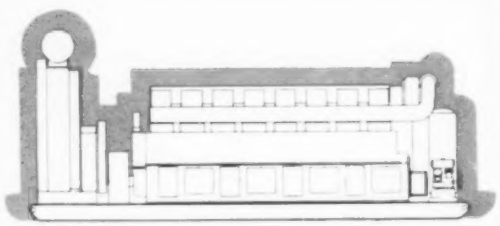
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

TURBOCHARGING HITS THE GAS FIELDS

You'll find the newest development for cutting costs of gas handling described on the following pages.

NEW TURBOCHARGED E

GIVES YOU BIG ENGINE PERFORMANCE, BIG E

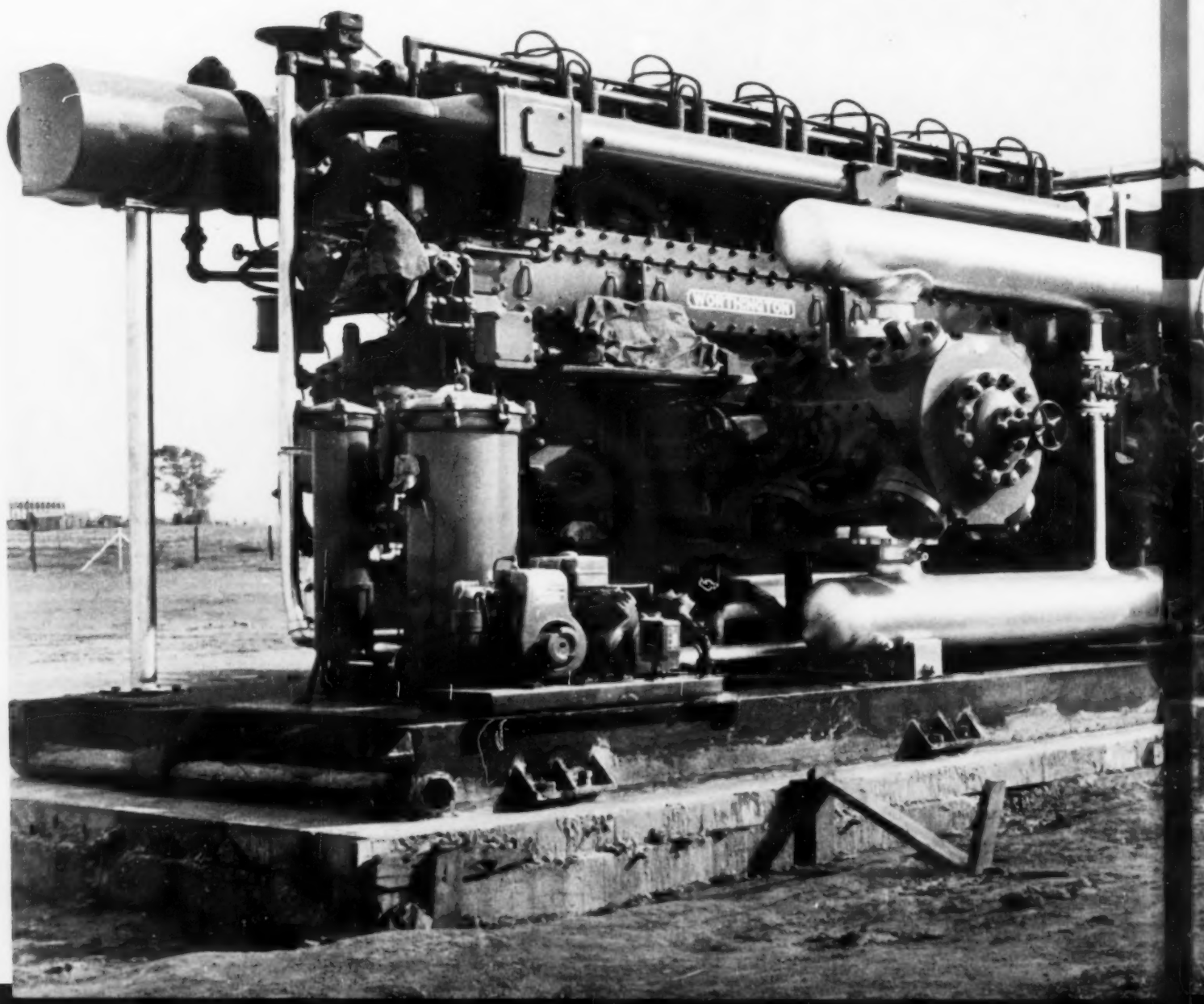


MORE COMPACT than non-turbocharged units, Worthington's new SLHC gas engine compressor cuts fabrication, installation, and moving expenses.

After five years of research, development and testing, Worthington now introduces the all-new SLHC—the only turbocharged gas-engine compressor in the medium horsepower range (330 to 880 hp.).

Turbocharging is the key to the SLHC's ability to slash gas handling costs. Turbocharging makes the new SLHC more compact, more economical, more reliable. Turbocharging gives you big engine performance, big engine economy in the smaller horsepower sizes.

MORE COMPACT—The new SLHC is considerably more compact than naturally aspirated units. Its smaller size cuts the cost of fabrication, installation and moving. Well under the maximum allowable



D ENGINE COMPRESSOR

BIG ENGINE ECONOMY IN SMALLER HP SIZES

width, the SLHC can move over most highways without special—and expensive—procedures.

MORE ECONOMICAL—Turbocharging gives the new SLHC the lowest fuel consumption of any engine compressor in its size range. At full load, you get guaranteed fuel consumption of only 7,000 Btu/bhp/hr. Heat rejection to the jacket water and lube oil is as much as 34% less than comparable non-turbocharged units. As a result, a smaller, less expensive radiator is required.

MORE RELIABLE—Its moderate engine speed (450 rpm) and conservative bmep makes the SLHC one of the most reliable four-cycle engines ever produced. It uses a turbocharging system proved by Worthington experience on thousands of engines for all types of application.

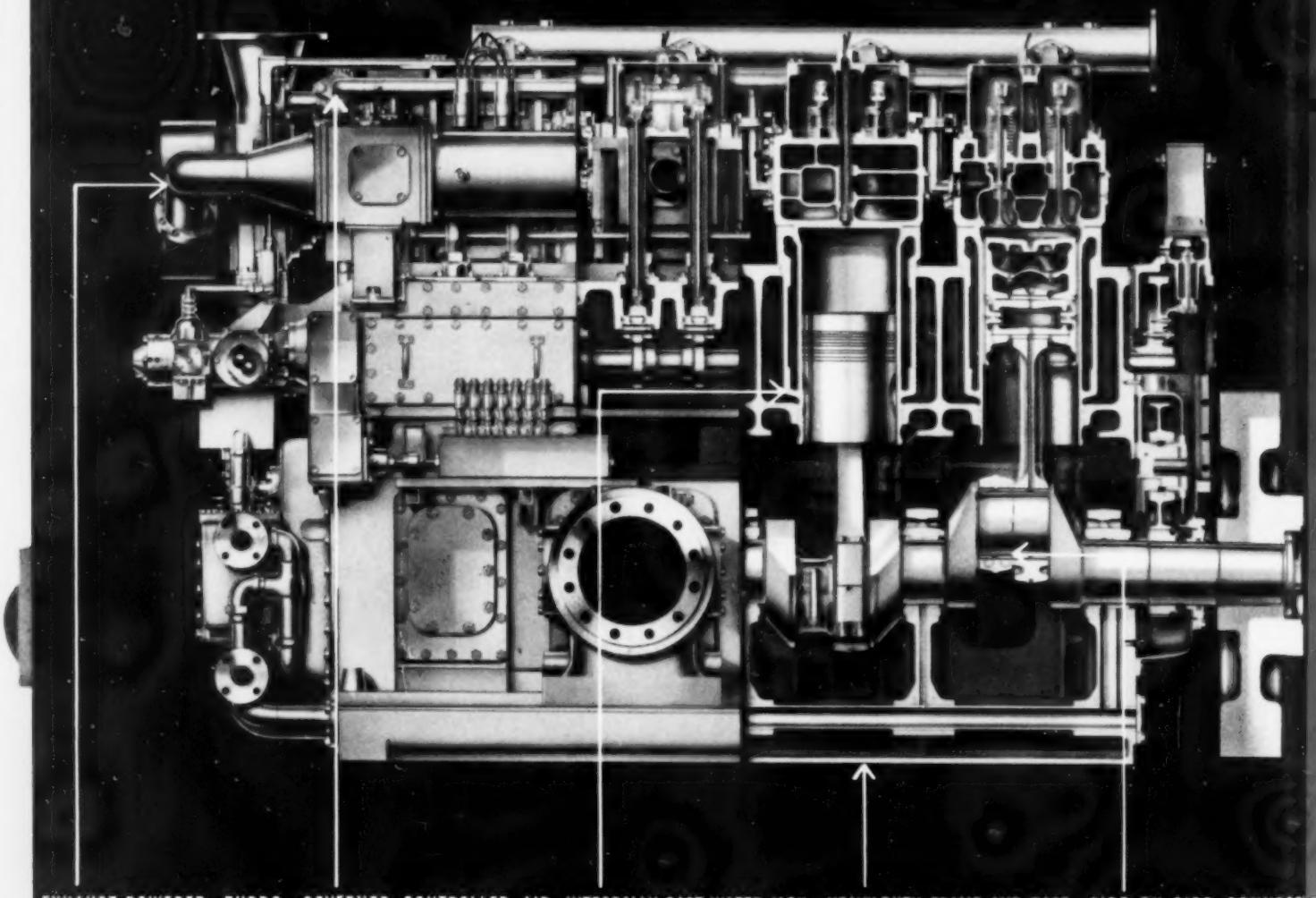
Now in quantity production at Worthington's Buffalo Division, the new SLHC gas-engine compressor is supplied in 4, 5, 6, 8, or 10 cylinder in-line units for skid-mounting or permanent installation. For more information mail coupon on next page. Worthington Corporation, Harrison, N. J.

WORTHINGTON

ONE OF THE FIRST INSTALLATIONS of an SLHC engine compressor is this gas gathering station in the Oklahoma Panhandle. This six cylinder unit is pumping gas to one of Northern Natural Gas Company's main line stations.

THESE ADVANCED FEATURES MAKE THE NEW SLH

5 YEARS AHEAD IN DESIGN



EXHAUST-POWERED TURBO-CHARGING gives maximum output per cubic inch of displacement in the minimum floor space and weight per brake horsepower.

GOVERNOR CONTROLLED AIR AND GAS VALVES meter correct air-gas ratio for every power condition. For maximum economy, system gives constant air-fuel ratio at all loads and speeds.

INTEGRALLY CAST WATER JACKET IN CYLINDER LINER. Water cannot leak into the crankcase. All water connections are external. This unique design is especially suitable for use with high-temperature cooling systems.

HEAVY-DUTY FRAME AND BASE. Massive, one-piece frame and base are of heavy cast iron construction. Symmetrical design of base permits mounting of compressor cylinders on either one or both sides of engine.

SIDE-BY-SIDE CONNECTI RODS give lowest bearing lo ing – most rugged and relia design. Pistons are fitted w full-floating wristpins.

RETURN COUPON: WORTHINGTON CORPORATION
Section E-75, Harrison, New Jersey

Please send me a copy of bulletin S-550-B27 outlining the advantages of the new turbocharged SLHC engine for gas handling operations.

NAME _____

COMPANY _____

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For more details see your nearest Worthington district office or send coupon at right for descriptive bulletin S-550-B27, Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955 Ltd., Brantford, Ontario.

July,

PIPE LINE PANORAMA

Texas Eastern to Boost Capacity . . . $96 million Texas Eastern expansion program has received green light from Federal Power Commission. Project will include:

- Reconversion of 1168-mile Little Inch (Baytown, Texas, to Moundsville, W. Va.) from natural gas to products service. Will connect with 14-inch line company plans to lay from Seymour, Ind., to Chicago. Cost: $35 million.
- Installations of new natural gas facilities to handle gas now being carried through Little Inch. Plans include 453 miles of 30-inch line loops and addition of 42,300 compressor horsepower. Cost: $61 million. When project is completed, Texas Eastern will be operating 1700 miles of products line and 5800 miles of natural gas lines.

F.P.C. OK's Higher CATCO Rates . . . CATCO group (Continental, Atlantic, Tidewater, Cities Service) will get 21.4 cents per Mcf for its offshore natural gas production. F.P.C. had originally ruled group could charge only 17 cents, but reversed its decision at rehearing during last week in June. Vote was 3 to 1. Dissenter: Wm. R. Connole who held that federal regulation orders should not be reversed.

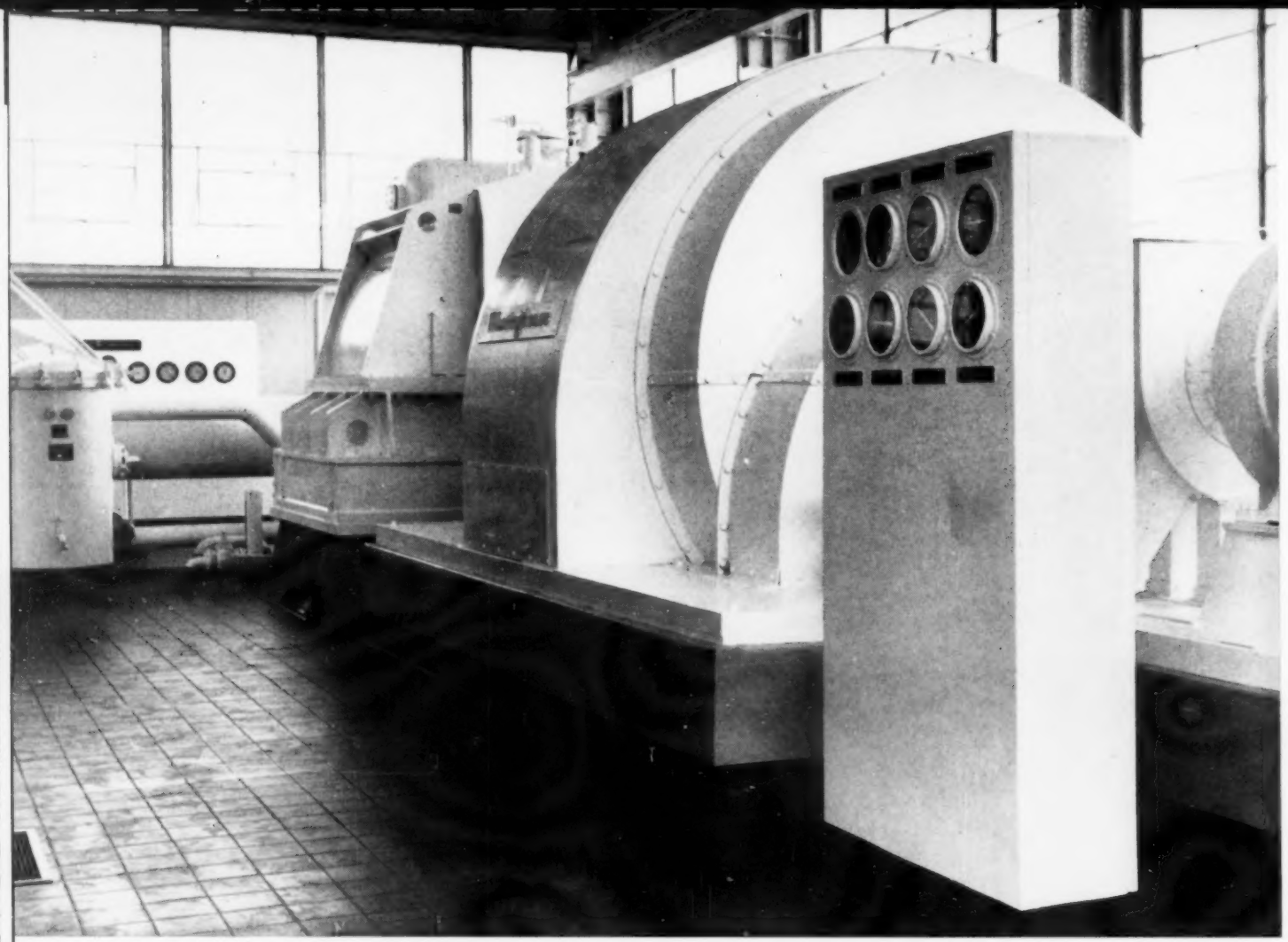
Giant Motors Cut Station Costs . . . Largest single unit prime movers ever installed for gas transmission have completed "shakedown" service on Texas Eastern's main line. At three stations, a 15,000 hp synchronous electric motor drives a centrifugal compressor through a speed increaser. Big advantage: Construction cost for giant 15,000 hp station is $114.04 per installed horsepower, compared with $212.50 per hp for smaller multiple units. Units are designed so conversion to remote operation can be readily accomplished.

O'Mahoney Probe Hits Snag . . . One phase of snoop into pipe line industry affairs appears to have run into trouble. After unprecedented public hearing on preliminary report lambasting the pipe line industry, Senator Dirksen (Ill.) threw some strong criticisms in the direction of O'Mahoney's subcommittee staff. (See Editorial, Page 4.) He is questioning background qualifications of some of the probers.

Need Line Pipe? Some is Available . . . Manufacturers say there is mill space available on conversion basis for cold-rolled welded big inch pipe for prompt delivery to any domestic crude oil pipe line construction project. Cutbacks of plate orders by the auto industry mean there is now more plate for rolling and welded pipe manufacture.

New Way to Curb Pulsation . . . Predictions are that Southwest Research Institute's electro-acoustical analog will play an increasingly important role in design of compressor piping systems. (See July, 1956, PLI, Page 30.) After solving more than 60 design problems, the electronic device has proved highly successful in combatting pulsation, reducing foundation and piping maintenance, and increasing safety.

Device is actually an electrical model of a compressor, including suction and discharge piping. Every electrical element in the analog corresponds directly with a mechanical element in the compressor system, thus providing information equivalent to field measurements at a compressor station.



THREE OF TEXAS EASTERN'S new compressor stations are driven by single 15,000 horsepower synchronous motors. The giant driver runs at 900 rpm, with a 100 percent load factor on 4160 volts and 1580 am peres at full load. Efficiency of the unit is better than 98 percent.

Texas Eastern's New Units Pack a Powerful Punch

Single 15,000 horsepower synchronous motor-centrifugal stations and dual gas turbine-centrifugals cut cost of construction almost in half.

By MELVIN A. JUDAH
Editor, PIPE LINE INDUSTRY

WHILE THE COST of pipe line construction continues to climb, Texas Eastern Transmission Corporation is cutting the capital outlay for stations sharply. Larger units, electric motors and gas turbines, are bringing about real savings as the company begins a record year of growth.

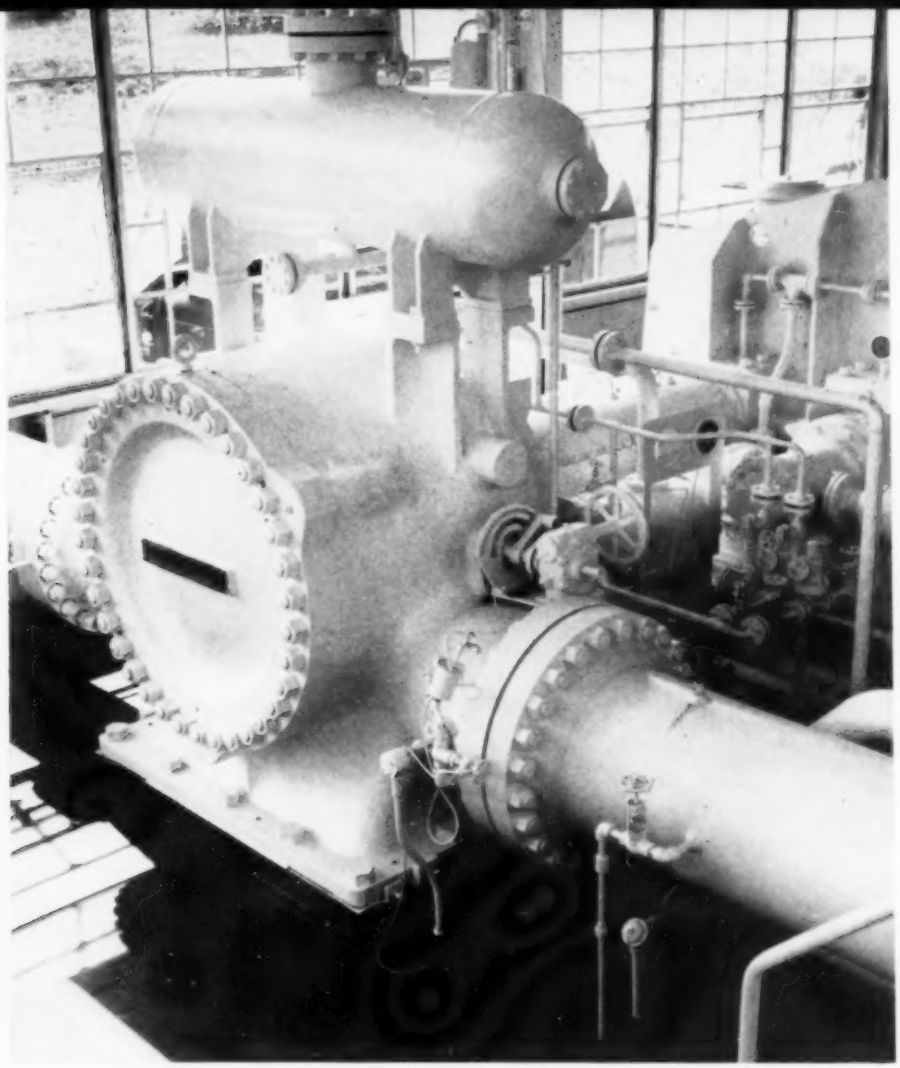
Three stations using a single 15,000 horsepower synchronous electric motor driving a centrifugal compressor have cost only $114.04 per horsepower as compared with $212.50 for earlier multiple electric motor stations.

In addition to a giant unit at Texas Eastern's Mount Pleasant, Tenn., station, two other stations have been installed at Egypt, Miss., and Tompkinsville, Ky.

Operating economy is particularly attractive where power rates are low, such as in the TVA area through which Texas Eastern's main line passes.

Texas Eastern engineers designed several innovations into the giant single unit synchronous motor stations. In size they are unique in the gas transmission industry; the horsepower rating for a single prime mover is about twice that installed at any compressor station before. Smaller electric motors have been used on gas transmission lines, but the 15,000 synchronous unit was a distinct departure from ordinary design.

The motor features "across-the-line" starting which reduced start-up problems and at the same time cut cost of switch gear by some $75,000. Motor efficiency is better than 98 percent; efficiency of the speed increaser unit is approximately 98 percent giving a high power delivery to the compressor. Motor speed is 900 revolutions per minute, on a three-phase, 60 cycles power supply. It operates with 100 percent power factor



CENTRIFUGAL COMPRESSOR at Mt. Pleasant, Tenn. station achieves a record compression ratio of 1.51 for a single unit. Adjustable inlet guide vanes are varied for maximum pressure control.

on 4160 volts and 1580 amperes at full load. The motor exciter is a 30 kilowatt, 125 volt direct connected unit. Total weight of the prime mover is 116,000 lbs.

Performance Rating High. On-the-line starting features of the large motor have been very satisfactory at the Texas Eastern stations. The motor delivers a full-load torque of 87,500 foot-pounds both at starting and at 95 percent speed with full voltage on the starter windings. Starting is accomplished across-the-line by closing the breaker and connecting it to the 4160 volt station bus in the outdoor switch gear substation. Starting current at full voltage is 8,000 amperes but motor voltage and resultant current drain are somewhat reduced by the reactance drop in the 12,000/16,000 kva transformer which supplies the station.

Units have a relatively high inertia load; the motor-gear-compressor system has a moment of inertia of 170,000 pound-feet^2 referred to the motor shaft. Some 43,000 horsepower-seconds of energy are delivered to accelerate the drive.

An equivalent heating effect occurs in the motor rotor requiring special construction of the starting winding. Metallic bars are embedded in the pole faces of the rotor and braced to segmental end rings to form a cage winding similar to that of an induction motor. End winding segments, instead of being bolted together between poles, are joined by flexible connectors made of thin copper strips silver plated to maintain surface conductivity.

Eight seconds are required for drive acceleration, after which control equipment applies excitation automatically at the correct speed and most favorable rotor position for smooth synchronization. When the motor is running synchronized, its starting winding is inoperative; hence, it is designed for maximum starting effectiveness without impairing the running efficiency of the motor.

Station Start-Up Sequence. Start-up of the Mount Pleasant station has been designed simply. The auxiliaries are started and seal oil pumps, air ventilation system, and lube oil pumps are placed in service. Purging is first completed; air is vented from the system for about five minutes. During this time, the seal oil reserve tank fills and the gas compressor case is purged. After five minutes, the purging valve is closed and the case is allowed to return to atmospheric pressure with gas fill. The motor is then started. After the motor is running normally, the compressor case is pressurized. After the pre-set case pressure is reached, the suction and discharge valves are opened. Opening of the suction valve is dictated by the automatic motor load controller.

Forced Ventilation Provides Safety. Fresh air supplied from outside the station by a 30,000 cubic feet per minute blower driven by a 30 hp explosion proof motor provides cooling air and pressurization for the prime mover. Ventilating air removes heat losses from the motor, exciter and motor collector and maintains motor housing pressure above atmospheric with fresh air. Exhaust air is discharged outside the building; air may be recirculated for heating the building in cold weather. A duplicate ventilating blower unit is also kept in standby service.

Frame Heaters Control Dampness. In addition to forced ventilation, 7200 watt frame heaters maintain a frame temperature high enough to prevent condensation of moisture inside the motor. They are set for a maximum temperature of 200° C. Oil immersion heaters rated at 1000 watts installed in each bearing pedestal maintain the proper oil starting temperature.

Speed Increaser Design. The 17,250 hp rating of the speed gear is based on the driving motor rating of 15,000 hp and a 1.15 service factor. A centrifugal shaft speed of 6506 rpm is developed with a 900 rpm motor speed. Because the high stored energy in the rotating parts of the system makes starting conditions difficult, the gear was designed for a minimum moment of inertia. Keeping the low speed gear diameter to a minimum was a big problem since the moment of inertia of this gear represents by far the major portion of that of the

gear unit. Reducing the low speed gear diameter meant an attempt to reduce center distance. To maintain sufficient horsepower capacity, this in turn meant widening the face and, of course, increasing the bearing span. In the high speed shaft this presented a problem of deflection. All of these considerations led to a final design calling for a gear unit having a 42-inch center distance and 34-inch face with gearing being heat treated.

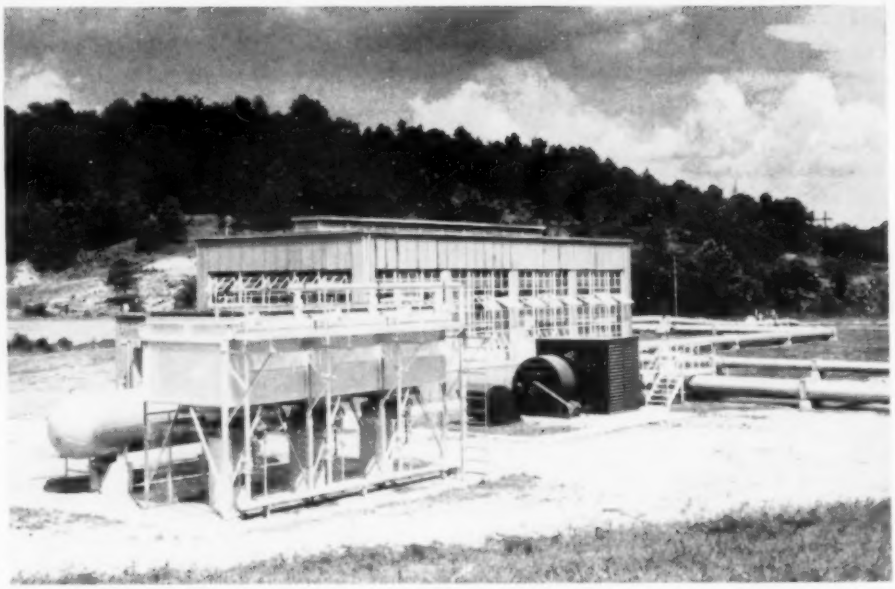
Three Bearings Prevent Deflection. Heat treatment allowed a higher rating on the unit. An unusual design which utilizes three bearings on the high speed shaft reduces bearing spans and eliminates the problem of shaft deflection.

As built, the gear unit has a moment of inertia of approximately 68,000 pound-feet^2 including the low speed coupling. Low speed coupling of the gear is so constructed as to limit the endfloat of the motor shaft to 3/16-inch. Both the high-speed and low-speed shaft extensions are tapered to ease field servicing.

Lube Oil System. The main lube oil pump is coupled directly to the gear unit low speed shaft. It supplies oil for lubrication and cooling to the complete installation including motor bearings, gear unit and compressor. Main oil sump is located in the bed plate directly beneath the gear. Oil from the gear drops into the main sump; from there it is drawn into the suction line of the pump. A seal oil pump is coupled directly to the high speed shaft. For starting, stopping and emergencies, an auxiliary motor driven seal oil pump is utilized. Pumps are started and stopped automatically through pressure switches.

Since water for cooling was not available at the stations, air-to-oil fan type coolers were utilized. Three coolers are in service at each station. Ambient temperatures vary considerably, so coolers were selected to meet a wide range of operations. Adjustments are provided by a two speed motor driving the fans; fan housing louvers are adjustable and piping and valving is fitted so that oil can by-pass the coolers. Three coolers were selected to permit servicing of one while two were still operating on the line.

Six 5,000 watt oil sump immersion heaters maintain proper oil temperatures in cold weather and prevent condensation of moisture in the sump.



STAINLESS STEEL panel walls of a new single unit electric station reduce maintenance to a minimum. Forced draft ventilation blower and standby provide fresh cooling air to motor.

Centrifugal Has High Compression Ratio. The 15,000 hp, single-stage, single suction compressor achieves an unusually high compression ratio of 1.51 for a single unit. Its overhung impeller is 35½ inches in diameter. Adjustable inlet guide vanes are controlled to get maximum pressure. When it is desired to move a large amount of gas at a reduced head, the vanes are placed in a pre-rotation setting. Counter-rotation, on the other hand, causes the gas to enter the eye of the wheel opposite to the direction of rotation increasing the pressure rise. This modification in basic design allows a variation of approximately 40 pounds per square inch in pressure operating characteristics.

The compressor unit has 24-inch flanges; a vertical cover plate facilitates repairs. Diffuser may be modified to meet capacity. It is presently rated at a suction pressure of 632 psia, suction temperature of 65° F., and discharge pressure of 955 psia, handling 660 million cubic feet per day when operating at a speed of 6500 rpm.

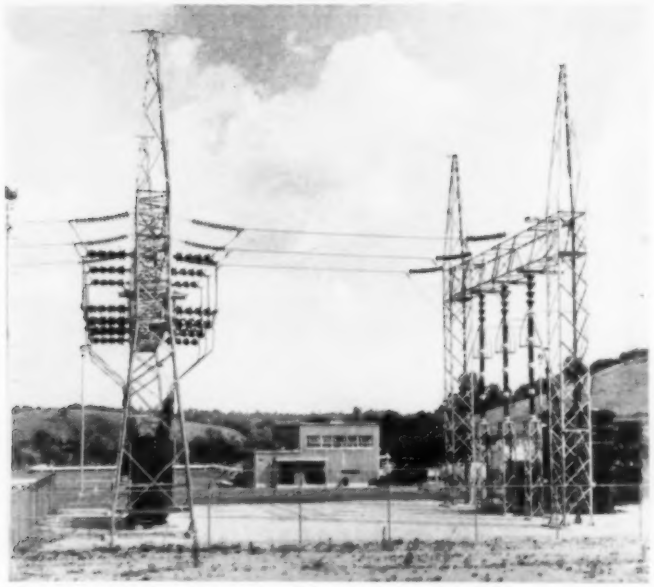
Surge Controller Protects Station. An 8-inch recycle line situated around the 20-inch by-pass check valve is equipped with an electrically operated plug valve. This provides a recycle system which may be set manually at any desired condition to increase mass flow through the compressor and relieve compressor surges during start up, stopping, or unstable periods of operation. Addition of the newly developed surge detector enables recycle valves to be operated automatically to prevent line surges. (See PIPE LINE INDUSTRY, April 1957, Page 41.)

Station Near TVA Line. Site of the Mt. Pleasant station had been selected specifically in relationship to a 161 kv transmission TVA supply line nearby. Proximity of the power line to the site contributed to the successful application of "across-the-line" starting. This system of starting has not resulted in any undue disturbances on the incoming power line while reducing costs of the transformer, breaker and electrical control equipment.

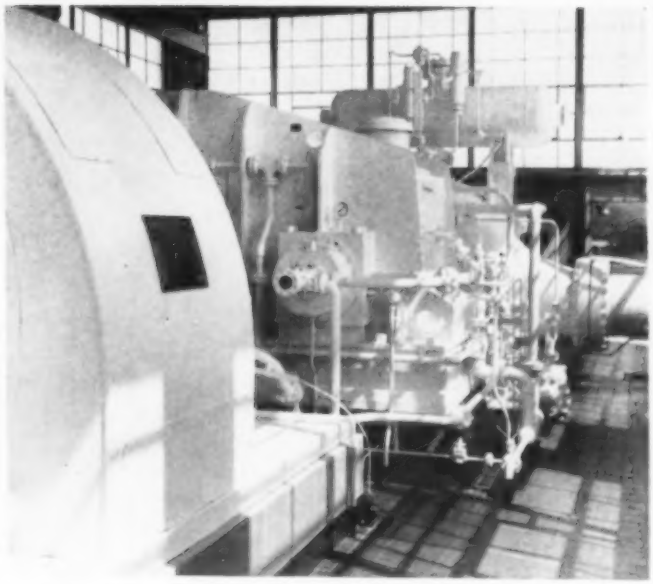
Stainless Steel Buildings. The main compressor building, measuring 24′ x 55′, has stainless steel external wall panels. It is built for an absolute minimum of maintenance and is very modern in appearance. A 22′ x 18′ control room adjoins the main station building.

Storage Field "Backs Up" Single Unit Stations. Availability of the large capacity of Oakford Storage in Pennsylvania enables Texas Eastern to bank on the large single unit stations along the southern 30-inch trunk line from Kosciusko, Miss., to Uniontown, Pa.

As originally designed, the Oakford Storage field had a capacity of 105 billion cubic feet and at one time early in last fall's operation, it was at



POWER IS SUPPLIED to Mt. Pleasant station from 161 KV TVA line nearby. "Across-the-line" starting cut cost of switchgear.



GEAR UNIT increases motor speed of 900 rpm to 6506 at the compressor shaft. Gearing was designed for minimum moment of inertia.

full capacity.

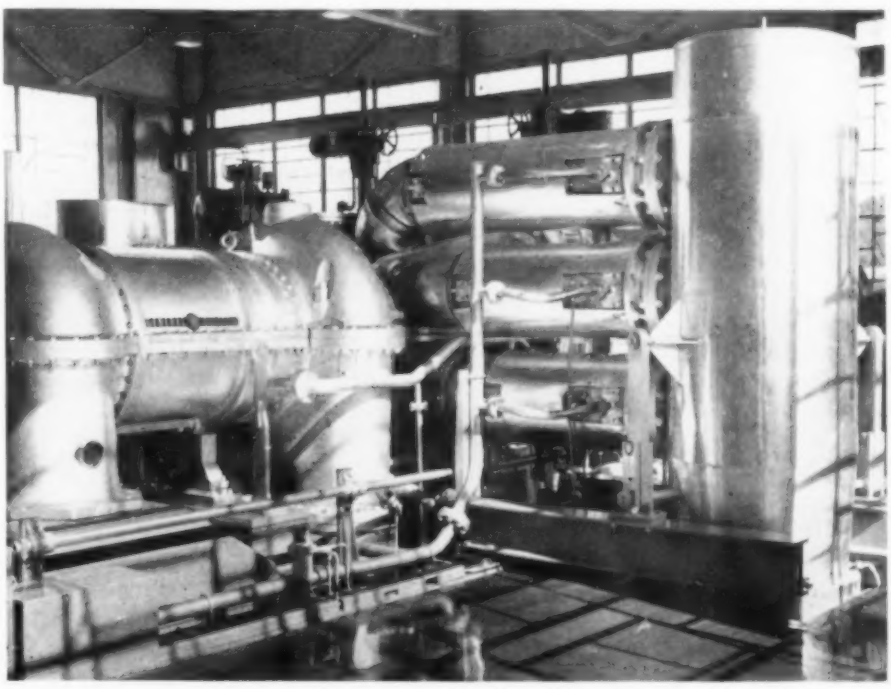
Even though the single unit stations might be out of service for a short period of time, the northern section of Texas Eastern's Big Inch line plus the Oakford Storage and line pack could handle demands for a short period. A stand-by unit is ruled out by the large cost of the 15,000 hp motors; however Texas Eastern's Vice President and Chief Engineer, Baxter D. Goodrich, has confidence in the operating advantage of these stations based upon the company's first few months of service.

Remote Operations Possible. Control system for the single large electric units could very easily be modified for unattended operation. At present the operating crew consists of a chief operator, four operators (one per shift and a relief operator), one mechanics helper and a maintenance man. Few operating control changes would be necessary; with push button starting and stopping it could very easily be modified for remote operation in the future. This is also true of several of Texas Eastern's other gas turbine stations and multiple unit electric motor stations.

New Gas Turbine Units Complete Shake Down

Two of Texas Eastern's dual 7600 hp gas turbine-centrifugal units also have just completed over a year of operations with a high performance record. These gas turbines are the largest ones now in natural gas transmission service; they have several design innovations. One important operating feature was the "straight-through" gas piping arrangement between compressors. This piping is more efficient and less costly than expansion loop connections between compressors. Strains gages and instrument leads are harnessed to several fittings in the compressor piping to check out the effect of stress on this particular design.

Duct Work Gives Maximum Access. Exhaust of the turbines at Texas Eastern's new stations was turned downward, and regenerators were set at one side, giving maximum access to the horizontally split cased units for easier maintenance. This arrangement of the duct work together with single piece fabricated steel base



NEW 7600 hp gas turbines have an overall thermal efficiency of 28.5 percent. Adjustable turbine nozzle provides for maximum flexibility in speed control by regulating air compressor supply.

CONTROL PANEL of new 7600 hp gas turbine stations. Now attended by one operator per shift, they are naturals for automatic control.

DUCTWORK for new Texas Eastern stations was turned downward, regenerators were set at one side for maximum access to turbines.

mounting enabled the operating floor to be considerably lower than at earlier stations. Concrete foundations beneath the turbines have been simplified; all of these features contributed to the lower construction costs of the turbine installations. To give an example, cost of Athens, Ohio, station, $3,026,400 amounts to only $199.11 per installed horsepower. Texas Eastern now has another similar station in operation at Owingsville, Ky.; and additional stations under construction at Gillis, La., St. Francisville, Miss., and Clinton, Miss. These new units are due for initial service in the fall of 1957.

New gas turbines are two-shaft open cycle units with regenerators. Each turbine is provided with regenerator piping and duct connections, one air intake silencer, a gas expansion starting turbine, lubricating systems, speed governing equipment, sequential starting controls, safety shut down and alarm equipment. The turbine is of horizontally split-case design; all hot gas areas are lined with stainless steel. Over-all thermal efficiency of the gas turbine unit is 28.5 percent.

Adjustable Nozzle Varies Speed. An unusual operating feature of Texas Eastern's new turbines; the adjustable turbine nozzle, provides for flexibility in speed control. Power can be increased without changing the air compressor speed by shifting the inlet nozzle position of the 24 vane control.

Speed of the turbine air compressor is 6900 rpm; the power turbine runs at 5400 rpm. The air compressor comprises one turbine stage and 14 compressor stages; power turbine also is single stage. Maximum combustion chamber temperature rating is 1500° F.; fuel rate is 9.91 cubic feet per horsepower hour.

Turbine Starting Sequence. The gas turbine is first purged with air and spark fired as the starting turbine comes up to speed. A flame detector monitors the combustion chamber; starting sequence is stopped if the turbine is not fired off.

Each air regenerator consists of 16 bundles of 14 envelopes arranged for counterflow of exhaust gases and compressed air. Heating surface is of pin and channel extended surface, plate envelope type. Capacity is 99 pounds of compressed air per second at an air inlet temperature of 490° F., air outlet temperature 840° F.

The cooling water system provides for cooling of turbine and compressor lube oil—turbine shell, exhaust tube supports, second stage nozzle plus an auxiliary generator jacket.

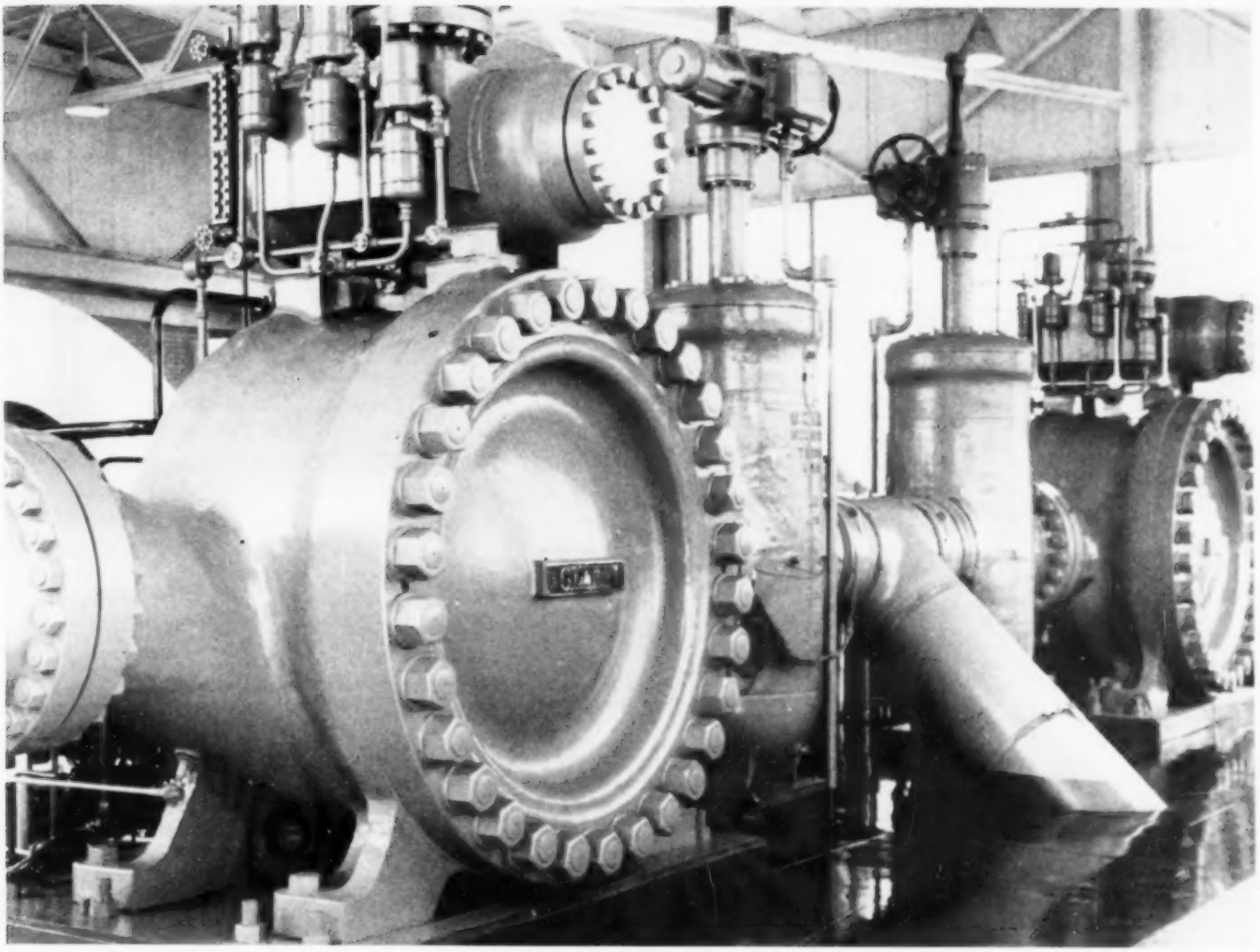
Compressors Operate in Series. The two 7600 hp single stage, single suction, centrifugal compressors have 32.6-inch diameter impellers. Each unit has 24-inch flanges, vertical cover plate for repair accessibility, and fixed angle inlet guide vanes. Compressors are rated for a station suction pressure of 637 lbs. per square inch, suction temperature 65° F., and a discharge pressure of 955 psia. The over-all station compression ratio is 1.50 with a discharge temperature of 126° F. Units handle 672 million cubic feet per day in normal operation.

Compressor Surge Controlled. Station surge control at Athens is accomplished by means of a 10-inch recycle line which can circulate gas flow from the station discharge line to the station suction. The recycle line is equipped with a 10-inch gate valve and electrically controlled operator sequently integrated into the station control system to regulate station load at some predetermined rate. It relieves compressor surges during start up and shut down by controlling the rate of flow through the compressor.

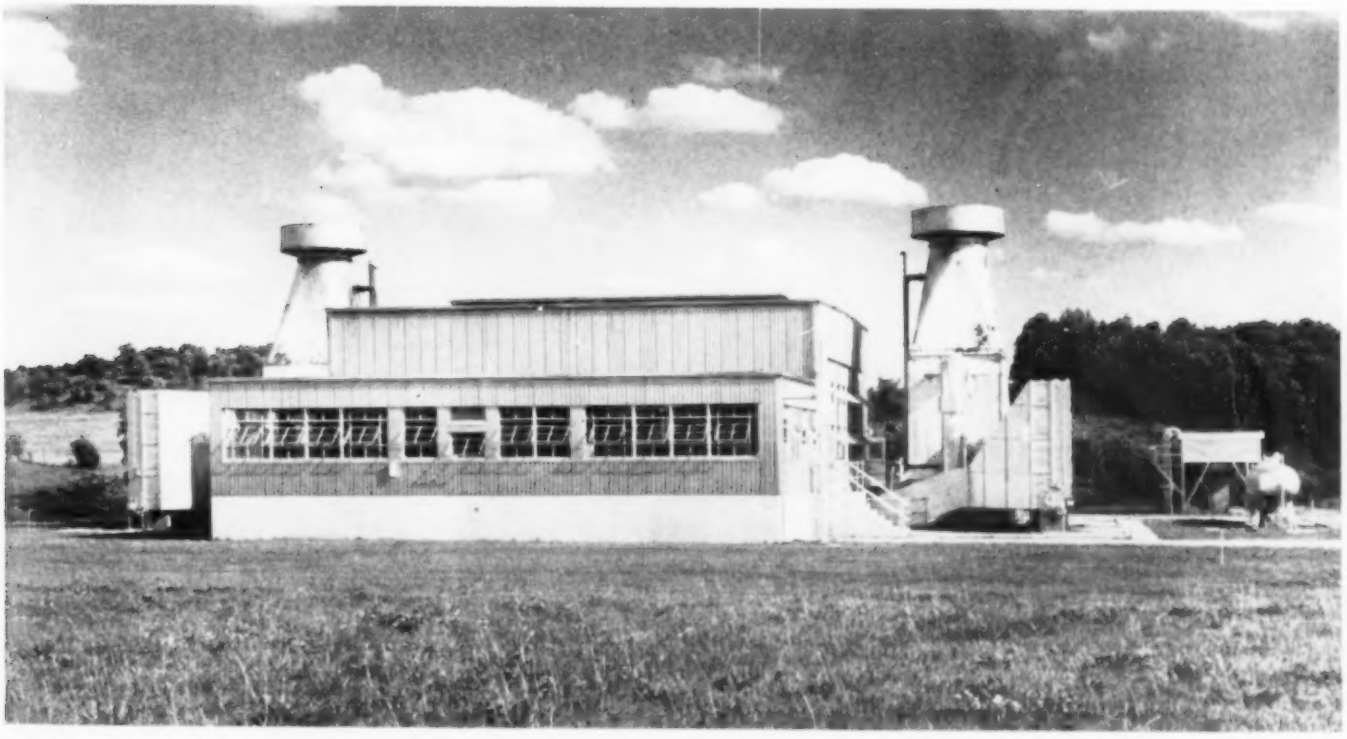
Emergency Station Protection. Emergency shutdown is provided by six push button stations and two manually operated valve stations which actuate the system. It closes the station suction and discharge plug valves, opens the single station blow off valve simultaneously while initiating the turbine sequential shutdown system.

The shutdown system is automatically activated by complete line failure or other type blowout. Controls are located at the station suction valve.

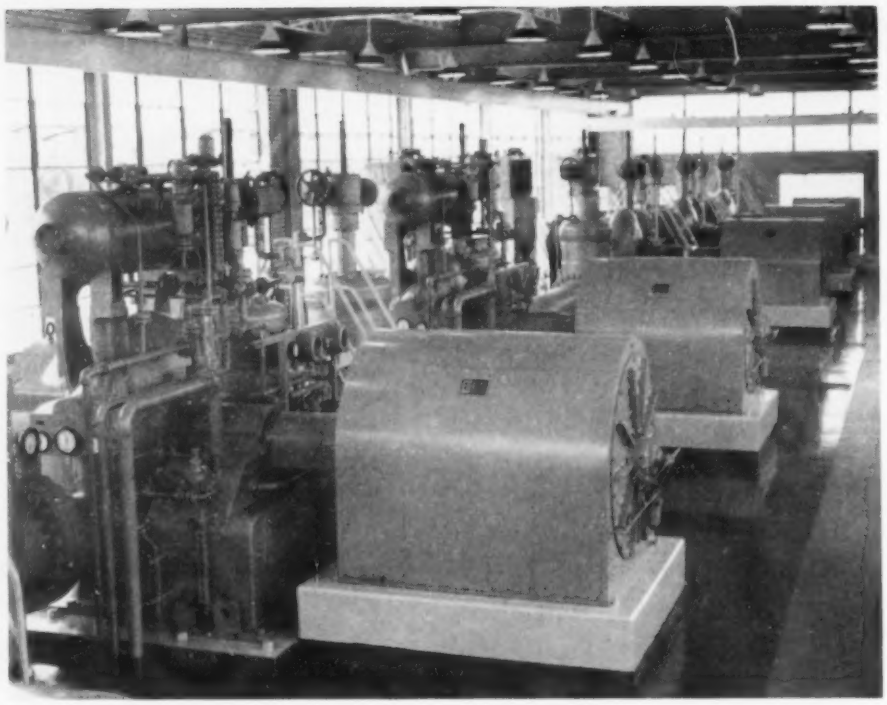
Main compressor building of the new turbine stations are also of stainless steel construction. Crews at the



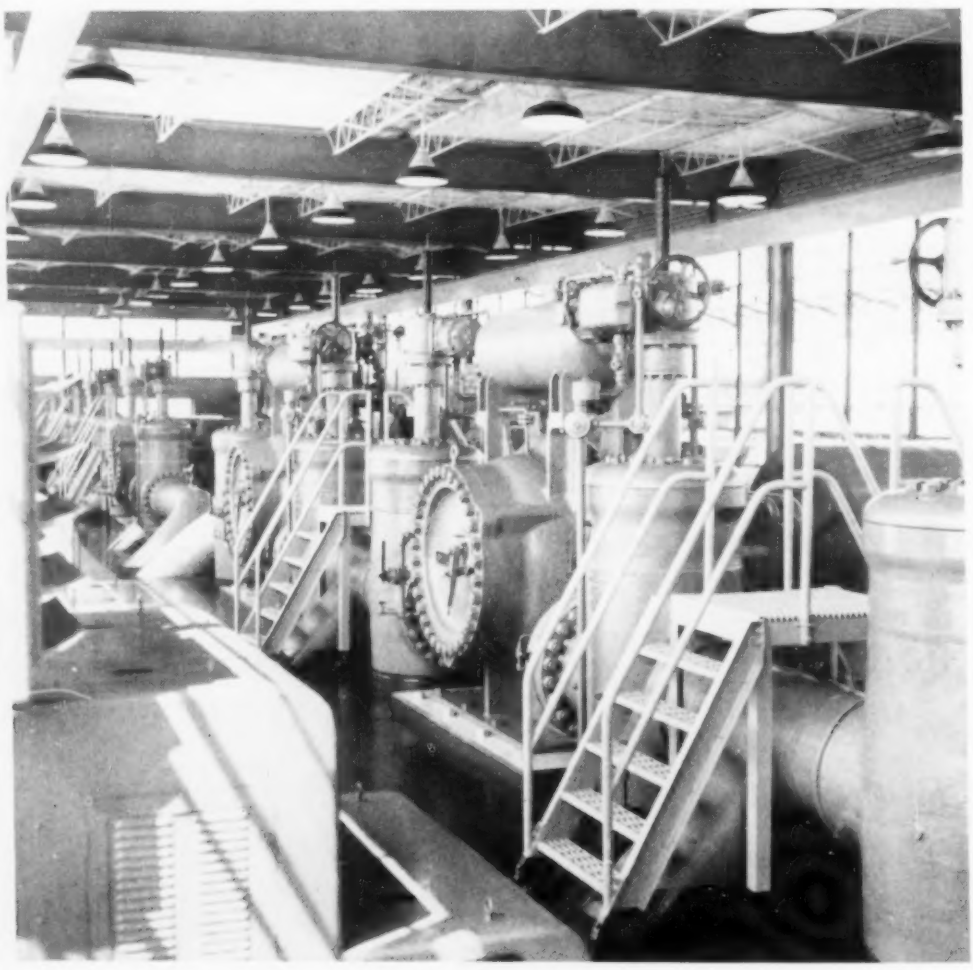
TWO COMPRESSORS operate in "straight-through" piping arrangement. Strain gages and instrument leads harnessed to gas piping check the effect of stress on this particular design. Single-suction, single-stage units have 32.6-inch impellers. Vertical cover plates provide repair accessibility.



TWO NEW dual-turbine units on Texas Eastern's main line utilized several design innovations to improve operations. Stainless-steel panel wall construction, straight through piping, and simplified duct and base designs cut construction costs.



ADDITION OF THREE 2500 horsepower squirrel-cage induction motors at four existing multiunit stations boost system capacity with economy. New compressors operate in parallel with old units.



COMPRESSORS AT multi-unit stations were first in gas transmission industry to utilize inlet guide vanes to vary pressure ratings. Setting of guides can change load up to 40 psi.

dual gas turbine unit stations consist of a chief operator, four operators (one per shift) an operator oiler, three oilers, one relief oiler, one mechanics helper and a maintenance man.

Controls are such that the stations could be modified for unattended operation with very few changes.

Additions to Existing Stations. New units are being added to several of Texas Eastern's stations, using both multiple electric motor drives and gas turbines. Typical of the four multi-unit electric stations that have had capacity boosts in the Gladeville, Tenn., station. Originally equipped with three 2500 horsepower squirrel-cage induction motors driving single stage compressors in series, horsepower was doubled by adding three more units of the same basic design. Additional units operate in parallel with the first group.

These stations were the first in the gas transmission industry to use the adjustable-inlet guide vanes for centrifugal compressors. Guide vanes have added flexibility to the operation of the compressors driven by the constant speed electric motors. Firewalls previously used in electric motor compressor stations were eliminated with application of forced draft ventilation for the motors.

Interesting figures are shown in comparing the cost of additions to these stations with original construction. Initial cost of the three unit 7500 hp stations was $212.50 per horsepower while cost of additional horsepower was $124.50, or resulting in the over-all cost of present stations of $168.50 per horsepower.

Prime movers at these stations are 2500 hp, squirrel cage induction motors of two pole, three phase, 60 cycle design. They are rated at 3600 rpm, 4160 volts, at 290 amps.

TABLE I

Operating characteristics of three electric motor driven centrifugal units in series. Two sets in parallel operation.

	1st Stg.	2nd Stg.	3rd Stg.
Suct. press. psia	649	739.5	841
Disch. press. psia	739.5	841	956
Suction temp. ° F	65	84.7	104.6
Disch. temp. ° F	84.7	104.6	125
Inlet cfm	4880	4457	4060
Capacity M^2 SCFD	330	330	330
Head Developed Ft. lb/lb	5600	5800	5950
Shaft Speed RPM	3570	3570	3570
Rated HP	2500	2500	2500
Present Impeller Dia. Inches	35	35	35
Case Hydrostatic test press.	1500 psi	1500 psi	1500 psi

Each unit drives a 2500 hp single stage centrifugal compressor through a direct drive. Compressors have overhung 35-inch diameter impellers, 24-inch flanges and adjustable inlet guide vanes. The compressor case has a vertical cover plate for repairs and maintenance.

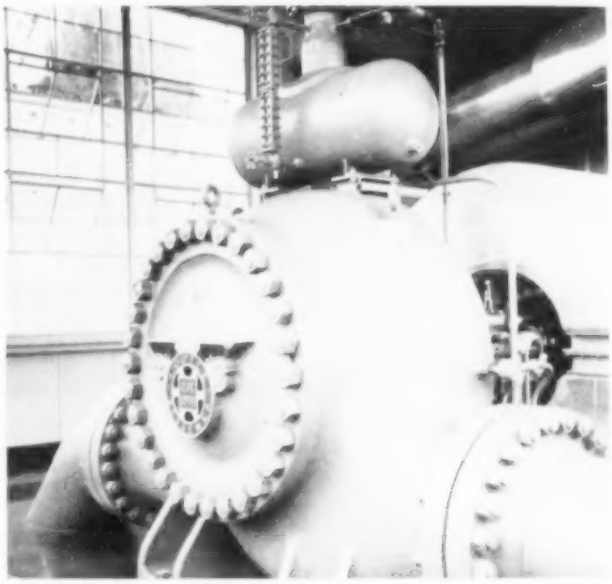
Single Turbine Boosters to be Doubled. Additional gas turbine-centrifugal units are being installed at four existing stations in Pennsylvania to increase deliveries from the Oakford Storage Field. Two of these stations now exist on the Penn-Jersey pipe line. The Grantville, Pa., station is typical. It now uses a 5000 hp gas turbine to drive a direct-coupled, single-stage centrifugal compressor. These particular gas turbines do not require any water service; an oil-to-water lube oil cooling system eliminates water problems at these stations.

A duplicate 5,000 hp gas turbine, single-stage centrifugal unit is now being added at the Grantville station. The 5,000 hp gas turbine is a two-shaft, open cycle, mechanical drive unit, with regenerator and variable speed control. The power gas turbine runs at 6,000 rpms while the axial compressor rotates at 6,200 rpm. There are 11 compressor stages in the axial, two in the air compressor turbine stage, and one in the gas power turbine.

A 5000 hp single-stage, single-suction, centrifugal compressor is of overhung design with a 33.6-inch diameter impeller. The unit has 24-inch flanges, and a vertical cover plate for repair accessibility. Angle of inlet guide vanes is fixed. It has a high head rating with sharply drooping characteristics produced by the blades in the diffuser. Coupling is a single engagement type, 17-inches long; a quill piece provides for start up and hot operation. Operating characteristics are 642 psi suction pressure, suction temperature of 45° F., and a dispressure of 879 psia. Station compression ratio for single unit operation is 1.36 with units handling 312 million cubic feet per day.

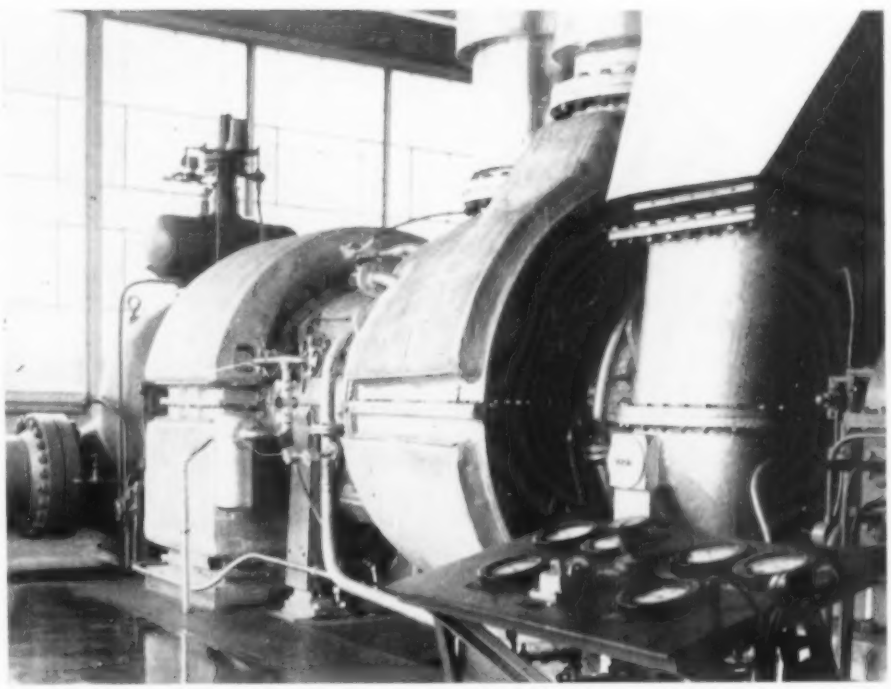
Gas turbines on the Texas Eastern systems give an added bonus in horsepower during coldest weather, when demands are highest from the Oakford Storage Field in western Pennsylvania to eastern customers. —**The End**

CAPACITY OF four stations delivering gas from Texas Eastern's Oakford Storage field will be doubled by addition of 5,000 hp gas turbine-centrifugal compressor units.



LEFT—Compressors to be added at four Pennsylvania stations will duplicate those now in service. Unit has a high head, sharply drooping characteristic.

BELOW—Gas turbine horsepower at expanded stations will be doubled by addition of another 5,000 hp two-shaft, open cycle, mechanical drive unit.



NATURAL GAS from yard piping at Panhandle Eastern's Montezuma compressor station screams from three blowdowns on the discharge side of the station during test of emergency shutdown equipment. Main targets of the test crews are the remote controls for fire gates.

'Dry Run' Tests Shutdown Systems

Here is a quick way to make certain your emergency systems will work when they are needed.

ENGINEERS AT PANHANDLE Eastern Pipe Line Company are making sure that station shutdown equipment will work in an emergency. "Dry runs" under simulated conditions have been made at three compressor stations. Further tests at other stations are being planned.

By putting the emergency shutdown equipment into actual operation, Panhandle's compressor station personnel know exactly what will happen in every sequence of a shutdown operation.

At each station there are three emergency shutdown control points, located a short distance from the main engine rooms. Pulling the lever at any one of them starts a sequence of automatic operations that will completely isolate the compressor station from the main line, shut down the compressor engines and blowdown the station.

For a successful shutdown, all operations must come off in their proper sequence.

Once the remote control station lever is actuated, two things happen simultaneously: the ignition systems of the engines are grounded, stopping the engines. At the same time, automatic operators on all suction and discharge fire gates in the station yard are actuated by air pressure. Valve operators, utilizing gas pressure, close each fire gate.

When the fire gates have closed, isolating the station from the main line, the all-important operation of blowing down the station piping follows. This automatic operation clears all high pressure gas lines as soon as the fire gates are closed.

Chief "targets" of the testing crews are the remote control fire gates and the blowdown controls. In an emergency both must operate immediately and in proper sequence.

Running the Tests. During the emergency "trials" men are posted at each gate to check operation of the valves. As a further safety measure, several station employes are stationed at two main line gate valve settings on the upstream side of the station. These men are in constant radio contact with personnel at the station and should upstream main line gas pressure build up too high, blowoffs at the gate settings would be opened.

Prior to the new testing program, Panhandle Eastern engineers tested fire gates by manually running the valves down to about half the distance required to actually close the gates. Present tests simulate actual emergency conditions. With gas in all three main lines, station personnel can now tell exactly what would have happened in the event of an emergency.

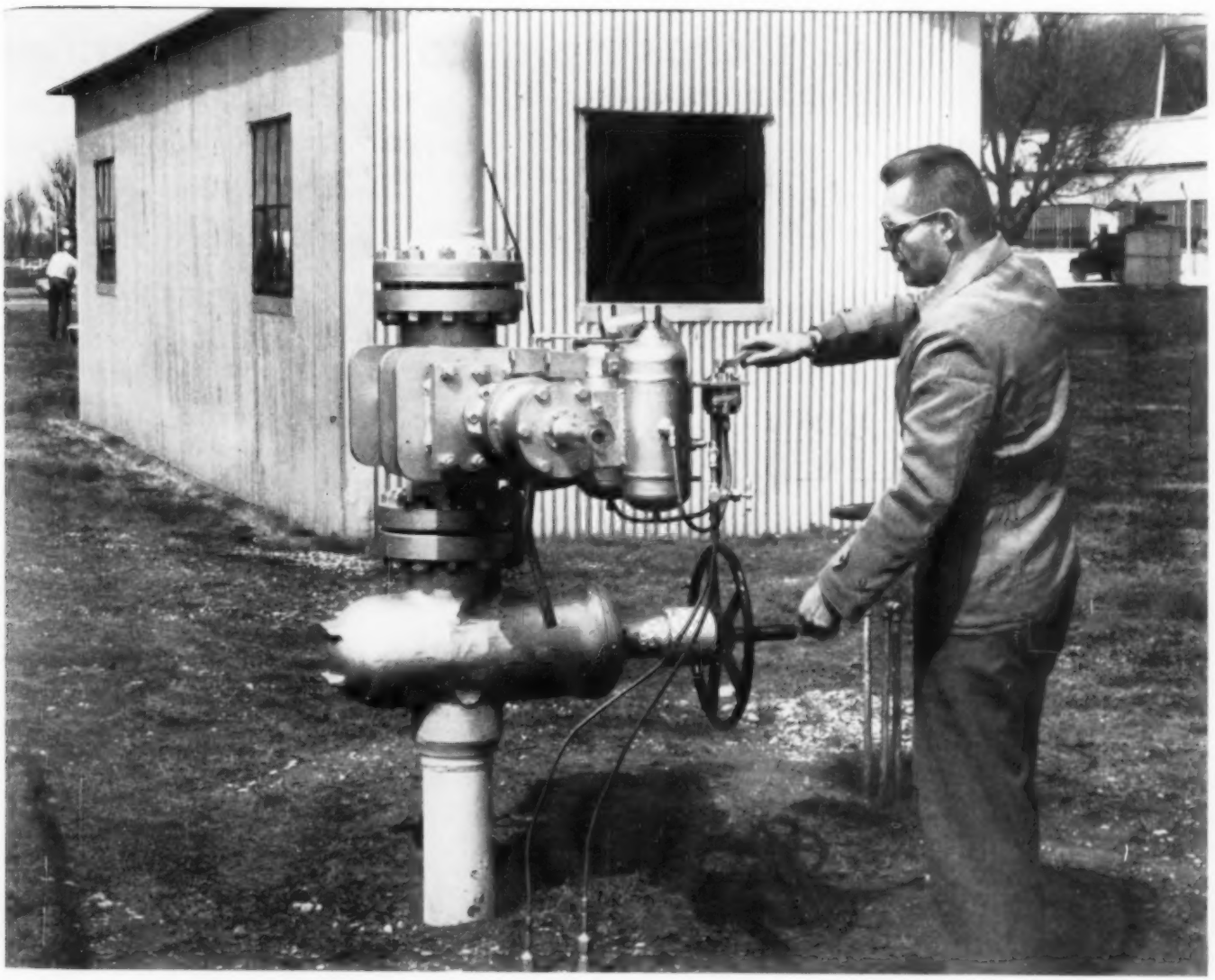
To give one example, if the blowdowns discharge gas for an excessive length of time the employes know for sure that one or more of the fire gates hasn't completely closed.

Tests Are Paying Off. One result of Panhandle's tests is the revamping of the compressor engines automatic shut down. Originally engines were stopped whenever the remote control was activated by grounding the ignition system. Recent tests have proved that this method is not dependable enough. Engines are now being converted to a pneumatic system for shutdown by closing off the low pressure fuel gas supply.

Panhandle engineers say full scale testing of the emergency shutdown systems won't be a one time thing. Tests are planned at each station, twice yearly. It will make sure that the emergency systems will work—in case of an emergency.

JIM GILLIAM, Panhandle's assistant superintendent of stations, trips lever to start test.

PLANS ARE DISCUSSED for the test. Communications were maintained throughout the station yard and to main line gate valves upstream with walkie-talkies for positive control.



Photos courtesy PANHANDLE LINES

EMERGENCY SHUTDOWN test completed, the valve on blowdown is closed, returning the system to normal operation.

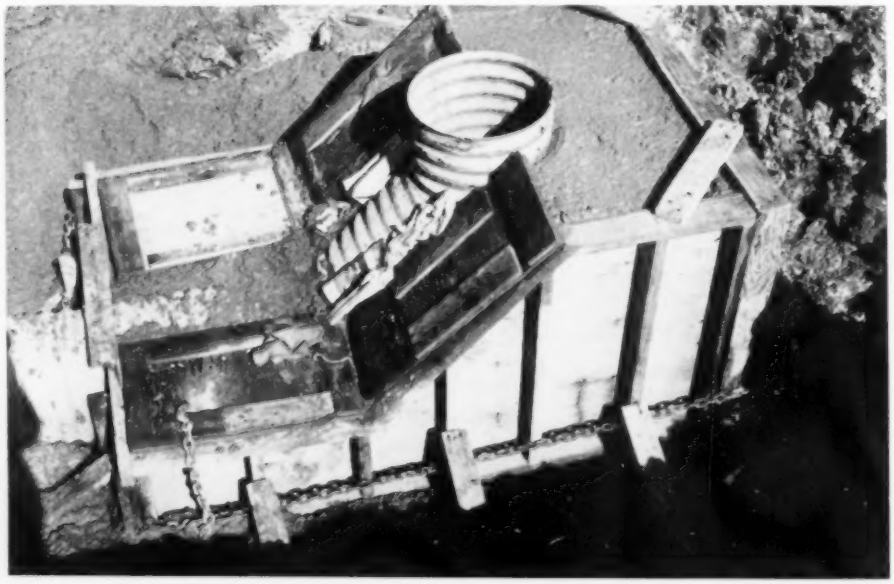
SOIL SAVING DAMS. Design of the drop inlet type dam was adapted to meet the contours of the right-of-way terrain. Erosion checked, gullies already begun to grow up in grass.

Dams Hold Cover Near Gullies

Heavily eroded terrain crossed by new transmission line called for special steps to hold cover and protect the buried pipe.

CONSTRUCTION OF 24 soil saving dams have gone a long way toward solving the problem of keeping soil cover on Natural Gas Pipe Line Company's new 20-inch North Texas supply lateral. Several miles of the right-of-way across Wise and Montague counties intersect severely eroded terrain in which many gullies have been cut. New drop-inlet dams hold up runoff water during heavy rains and give grass and brush a chance to grow back and reclaim the ravines.

Prior to building the dams, engi-



CONCRETE FOOTING was specified for all dams where the drop through the riser exceeded nine feet. Extension was later replaced and the soil was back-filled and tamped.

AN 18-INCH tube and riser was installed near the center of the pond to control runoff.

STOP R.O.W. EROSION. This gully is situated only 150 feet from the NGPL right-of-way. Washing away of soil had been continuing with up to as much as five feet of cut in only two years.

neers made extensive surveys of the areas; both the State and U. S. Conservation departments were consulted. Acting upon the advice of these groups and from previous operating experience it was decided that the soil saving drop inlet type dam would give the best protection to the pipe line and at the same time be of real benefit to the landowner. Dams were to be horseshoe shaped to meet the existing contours of the terrain. At each dam an 18-inch galvanized tube was set near the center of the pond to carry overflow run-off through the dam to the downstream ravine at a controlled rate. An emergency spillway carries off excess water during very heavy rains.

How the Dams Were Built. A typical dam illustrates construction. It was placed at the fork of two ravines on a severely eroded hillside. Studies revealed that erosion had been continuous over a long period of time. One fork had worked upstream about five feet in only the past two years. Right of way for the 20-inch line ran directly across one of these gullies and near the brink of the other. To hold the soil over the pipe line a drop-inlet dam was built 150 feet downstream from the right-of-way.

An elbow and inlet extension was installed at the junction of the two forks. This assembly consisted of the complete drainage tube, seals, coupling, elbow and the elbow extension. Concrete was poured to support the elbow footing. Footings were specified for all dams where the vertical drop through the elbow exceeded nine feet. During pouring of the concrete under the tube, the six foot extension was

Continued on Page 55

CRESCENT SHAPED dam was tamped in six-inch layers. After completion of fill and rolling, top soil was replaced and the dam was seeded and fertilized.

FENCE PROTECTS dam wall from livestock. Later silting required that some be raised.

FIGURE 1—This modern roof has underseal hangers and very few connections above the seal—the type most often ignited by lightning.

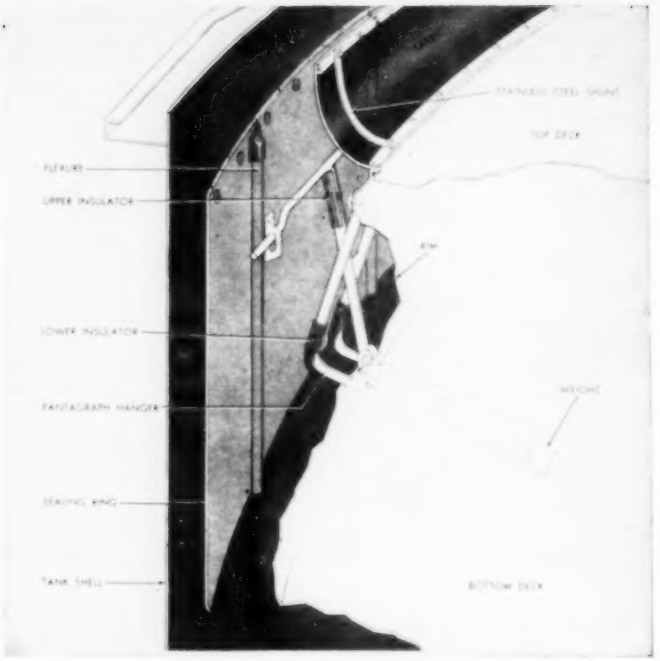


FIGURE 2—Shown above is example of older roofs with hanger contacts above seal and many points of bleed off to the atmosphere.

Fire Fighting Fundamentals

Floating Roof Tank Fires Can be Controlled

Lightning is the chief cause of this type of fire. Such fires can be extinguished, but prevention is easier.

By J. L. RISINGER, Maplewood, N. J.

FLOATING ROOF TANKS are designed to eliminate open oil surfaces from which vapors escape. Since open surfaces are eliminated in most instances, the probability of fire from static electricity charge is prevented as long as the roof is floating.

A few rim fires have occurred in these tanks when seals were in poor repair. There has been one claim of ignition from iron sulfide accumulation above the roof from storage of high sulfur content crude oil. This was claimed to have occurred when the roof was down in the tank for a considerable length of time.

No fires have been reported from static charge accumulation on the surface of the oil. However, it is to be kept in mind that this is highly possible when the roof is not afloat and when pumping in or agitating an oil in its vapor pressure range of temperature so as to produce an explosive vapor air mixture. Illustrative of this is gasoline below 10° F., aviation gasoline below 30° F., J.P.-4 from 10° F. to 80° F., and kerosine between 110° and 210° F. It can be seen that the one most often within the vapor pressure explosive mixture range is J.P.-4.

How to Prevent J.P.-4 Fires. To prevent fires in floating roof tanks in which J.P.-4 is stored, special precautions are required to prevent rapid charge accumulation during initial pumping until the roof has been floated. This filling should be done with no water bottom, and by gravity flow or very slow pumping in rate. Once the roof is afloat with these products, which at normal tem-

peratures are blanketed with a vapor-air mixture within the explosive range, the tank should not be pumped to below the floating depth of the roof except for cleaning or repairs.

Crude oil has not been known to accumulate a static charge on its surface faster than it can normally bleed off to the shell of the tank. Therefore, these precautions do not appear to be necessary even though the specific crude oil should have a vapor pressure conducive to explosive vapor-air mixtures near its surface.

Lightning Ignition of Floating Roof Tanks. For a period of years after the advent of the floating roof no fires were reported in these tanks from lightning ignition.

In recent years quite a few floating roof rim fires have been ignited by lightning. It might be assumed that the reason for this is the increased number of floating roofs. However, the proportionate number of lightning ignited fires is several times greater in recent years than formerly. To arrive at the real reason, the phenomena of lightning must be applied to the design and construction of the early floating roofs and those of recent years.

A few findings taken chiefly from the National Bureau of Standards Handbook H 40 will establish sufficient lightning phenomena on which to base corrective measures for the prevention of lightning ignition of floating roof rim fires.

Hazards of Streak Lightning. The secondary or induced effects from "streak" or chain lightning are responsible for a large majority of fires that occur in oil tanks, reservoirs and oil tank farms. These occur as a result of sparks produced in or about the tanks where burning vapor air mixtures exist.

Traveling on a conductor, streak lightning has a charge of such magnitude and force as to lead to the conclusion that it and its induced charges do not necessarily follow the path of least resistance to ground or other objects, but the nearest path to the greatest attraction. It appears that neither streak lightning nor a heavy induced charge from its flashes will turn sudden corners or go back in the direction from which it came, even if a considerable jump is required to another conductor leading in the same direction of its travel.

From this data it is possible to calculate the potentials which may be attained, and the values of change in potential gradient due to lightning flashes. In the case of a tank roof floating on the non-conductor oil and in the immediate vicinity of the flash where side flashes have been observed to jump several feet from small insulated metallic surfaces, the values of change in potential gradient would be difficult to calculate. Likewise, it would be difficult to calculate the number and capacity of contacts from the roof to the shell that would be necessary to prevent a side flash jump.

Even in the case of reservoirs and oil tanks inherently grounded, induced effects of lightning are accredited with ignition of a large majority of fires as a result of sparks produced in or about the tanks where escaping gases can be ignited.

Value of Hanging Roofs and Projections. In Figure 1, the seal of the floating roof has been added. The ladder and hangers have been placed. These would take care of lightning induced charges only on the roof. However, charges of considerable magnitude would no doubt jump between roof and shell under the seal, or meet with sufficient resistance along the hanger to produce a high enough temperature to ignite vapors in the explosive range. This drawing brings the completely insulated metal body—the roof—to an approach of the modern floating roof in which a majority of lightning ignited rim fires have occurred.

In the early history of floating roofs there were few lightning ignited rim fires in floating roof tanks. A study of the first floating roofs reveal that there were more hangers, and these hangers were above the seal. (See Figure 2). Most of the roofs had a network of pipes and projections from the roof, and many had wire connections extending from these pipes to hangers. Many of the modern roofs also have these pipes and some the wire connections.

Some of the old roofs had such a network of wires above the roof as to resemble the Farady cage. Comparing this type of roof with Figure 1, it can be concluded that lightning ignited rim fires in floating roof tanks have increased with the reduction in the number and capacitance of direct contacts between the roof and the shell of the tank above the seal. The same is true with projections from the roof which might bleed off the induced charge to the atmosphere.

Perhaps floating roof rim fires have occurred from direct hits which ignited leaking vapors when roofs were near the tap. But evidence strongly indicates that all, or all but a few, of these fires have resulted from induced charges on roofs not sufficiently in direct channel contact above the seals of the tanks.

In a study of these ignitions observers have noted the

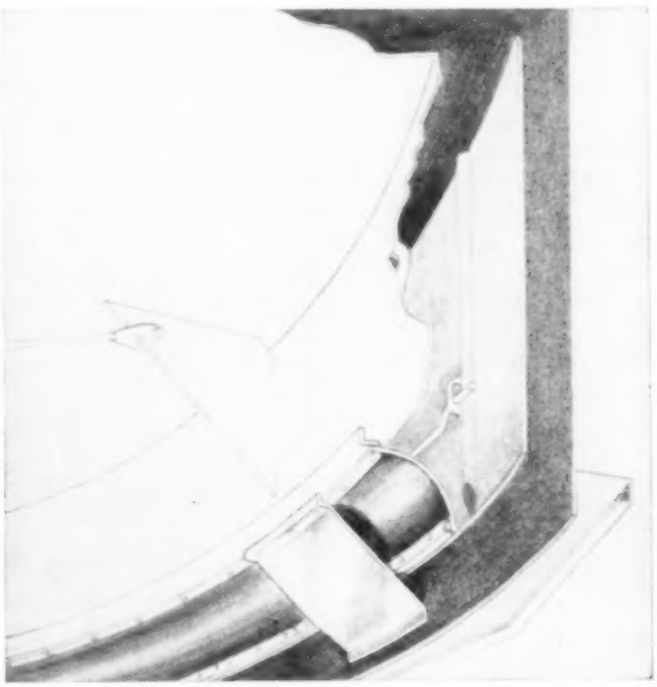


FIGURE 3—The drawing above illustrates a roof with wide bands extending from roof to shell. Tests are being run on effectiveness of a sufficient number of wide strips of steel welded to the edge of the roof bridging the seal and pressing against the shell of the tank.

FACTS YOU SHOULD KNOW ABOUT FLOATING ROOF TANK FIRES

1. The chief cause of floating roof rim fires is lightning.

2. However, few if any floating roof rim fires are the result of direct lightning strikes. Most, if not all, lightning ignited floating roof rim fires result from induced charges on the roof, which in the immediate vicinity of the thunder storm, may reach a potential gradient immediately after a flash comparable to the appearance of a direct hit.

3. Lightning ignited rim fires in floating roof tanks have increased with changes in design. The changes have reduced the number and capacitance of direct contacts between the roof and shell of the tank above the roofs or contained seal, and projections and cross wires above the roof contacting the shell of the tank.

4. To prevent lightning ignition of floating roof rim fires, establish on those roofs not having them the required number and capacity of direct and straight channeled contacts between the roof and shell of the tank. In tanks with under seal, vapors bridge the seal with these contacts.

5. The providing of a Farady Cage on a floating roof might reduce the ignition. However, the most feasible method of preventing ignitions appears to be the establishment of contacts between the roof and shell above the gas tight seal.

6. Floating roof rim fires can be effectively fought and easily extinguished with portable equipment. The ease with which these fires can be extinguished is dependent upon the attack of the fire before large sections, or all of the seal has burned out.

flash on the tanks, sometimes even hearing the clap. None have reported seeing the streak leave the cloud and strike the tank. The reaction at ignition of these floating roof rim fires also support the induced charge conclusions.

In one case where six crude oil tanks of a group of 12 were ignited simultaneously when a low hanging electrically charged cloud passed over them, the seal of the floating roof of one of the tanks blew out at six places around the tank. These roofs were of the under seal hanger type. No doubt flame occurred simultaneously under the seal at these six points.

Preventive Measures. When the rim fires in floating roof tanks began to increase in number, it was thought that extensive grounding of the tank and the providing of bond wires from the roof of the tank to the shell would solve the problem. Neither of these had any noticeable effect on the number of ignitions.

In fact, in a heavy lightning area a floating roof gasoline tank was ignited at the rim by lightning. It was a double-deck, pantagraph, under seal hanger type roof and the explosion under the seal blew out about a third of it and actually bulged the shell of the tank, and bent the roof at the point of explosion. The tank was repaired, heavily grounded with auxiliary ground wires and pipe driven to constantly wet soil. The recommended bonding cables from roof to shell were installed and the tank put back into service.

One month later the tank was again ignited during an electrical storm in the same manner as before. The six crude oil tanks that were ignited simultaneously were grounded and equipped with bonding cables from roof to shell.

After these fires, grounds and bonds were tested and there was no greater resistance between the roof and shell when they were disconnected than with them connected. However, they were left connected, tanks repaired and put back into service.

Twenty-six days later during an electrical storm, one of the tanks was ignited again. The added contacts from roof to shell may have reduced chances for ignition as a result of induced charges, especially light ones. However, they did not do the total job of preventing them.

Experience indicates that even where the roof hangers are above the seal, they—together with the ladder—are not enough to provide a sufficient area of connection at the right places to prevent all fires. Neither will the auxiliary cable and wire bonding provide the contact required. Also, grounding of the tank itself will not greatly influence the number of lightning ignitions of these tanks.

No doubt if the seal itself was of effective conductive material, the lightning ignitions would be reduced provided the seal was kept in good repair. However, no material has been found out of which to build seals that have as little resistance as metals. Therefore, there might be sufficient resistance in the seal to cause it to be ripped open.

Some companies build floating roofs in which a rim of steel presses directly against the shell of the tank as a shoe or hanger under which the seal itself extends below liquid level. This is a new type and there has not been sufficient experience to substantiate that they will not become lightning ignited. However, none have occurred in these tanks to date, and their construction would indicate that such ignitions should be very rare, if ever.

Extensive tests are being made by one manufacturer to determine the best methods to provide necessary contacts between the roof and shell of tanks that do not have contacts above the seal. These tests include a system of a sufficient number of wide strips of stainless steel attached to the roof, bridging the seal and pressing against

the shell above it. If a sufficient number of these are used it is believed they will serve the purpose (See Figure 3).

Steel strips are not required on roofs where there are multiple contacts between the roof and shell of the tank above a tight seal, or if a sufficient number and capacity of contacts are under the seal which rests directly on the surface of the tank. It is to be kept in mind, however, that oil is insulating and current will not travel as readily along the surface of a metal submerged in oil as in the atmosphere.

In figuring the justification for the extra construction and design required as precautions against ignitions of floating roof rim fires on the graded risk basis, consideration should be given to:

- Standard design of the roof.
- The height of structures in the vicinity of the tank.
- The frequency of thunderstorms in the region.

Extinguishment of Floating Roof Fires. Floating roof rim fires can be easily extinguished by use of foam hose nozzles from the top platform, driving the fire away from beneath the platform with the foam, fog, or dry chemical and then proceeding around the tank.

In heavy lightning areas some companies place a line with a Y-connection, with valves on each angle of the Y, so that foam, started from ground level, will drop from the bottom line of the Y onto the seal below the platform and extinguish the fire at that point. Then the fire fighters can mount the steps and platform, connect a hose to the top line of the Y, open the valve on the line, close the valve on the bottom line, and then extinguish the remainder of the rim fire from the roof of the tank by use of the foam line and nozzle.

Rim fires have been successfully fought with dry chemical extinguishers, in sizes in accordance with the size of the fire—also by sliding a light foam tower (applicator) around the tank to cover the seal where burning. If this method is to be used, attention should be given in advance to see that the croak of the tower is wide enough to span the wind girder.

Other companies are building a walkway around the tank below the tap. From these walkways the rim fires can be easily extinguished by use of portable equipment. Some have allowed the fires to continue to burn until the tank was completely lost because of the fear of getting on the roof to extinguish the fire.

If the fire can be extinguished and kept extinguished around the ladder, especially on pontoon and double deck roofs, the fire can be safely fought from the roof unless the complete seal is on fire and the roof is so low that flames and smoke are too severe on the fire fighter.

If the fire is to be extinguished with dry chemical, and the rim is on fire around the entire roof, two men should attack the fire simultaneously in team work, starting together, then going in opposite directions and meeting at the opposite side of the tank.

It is best to plan the fighting of these fires in advance of their occurrence, and better still to prevent the fires so that plans will not have to be put into execution.

Dams Hold Cover

(Continued From Page 51.)

temporarily removed. A second pour of concrete supported the elbow. The extension was then replaced and uniformly back-filled with earth and air tamped.

Next came the construction of the earth-filled dam. Raw forks of the gullies were covered. Earth moving machinery transported and tamped the soil in six-inch layers; top soil was worked out onto a 2:1 slope.

An emergency spillway was constructed at the upper portion of the dam to carry excess runoffs from heavy rains. The entire site was then fenced, seeded, and fertilized.

During normal rainfall since the dams were completed, ponds filled up to the top of the drain tube. A head of water of 1½ feet or more above the lip will cause the tube to run full. Head of the emergency spillway is 1.8 feet higher than the top lip of the tube.

Recent Rains Prove Dam's Worth. Dams, once completed, soon showed their effectiveness. The section of gully below the dam began to grow over with grass, bushes and young trees. After several rains the basin silted full, and the fence near the inlet tube had to be raised.

Besides eliminating erosion and keeping a protective covering over the line at all times, the soil-saving dams have also added the benefits of filling in ravines across the right-of-way, forming ponds for watering of livestock and have proved a good public relations step by benefiting landowners and the local soil conservation districts.

Photos from BETWEEN THE LINES

RAIN PROVES dam's value. Runoff water was held up until it reached the top of the riser and was then drained off through the dam to the ravine below at a controlled rate. Spillway shown at right handles excessive overflow during heavy rains and prevents cutting of dam wall.

Facts About Pump Packings and Seals

Operations Handbook

1 Packing Boxes and Glands
2 **Packings**
3 Mechanical Seals
4 Mechanical Seal Maintenance
5 Packing Maintenance

This handy guide will help you to select the correct packing for any particular application.

By HAROLD WOODHOUSE
Dean Hill Pump Company
Indianapolis

ALTHOUGH THERE ARE several types of packing, only the "jam" type is normally applicable to centrifugal pumps. This type includes any packing that is jammed into a packing box and adjusted from time to time by tightening nuts on a gland.

These packings are twisted, woven, bulk, coil, moulded, stick or laminated and of many materials including hemp, flax, wool, ramie, cotton, rubber, leather, fibre, asbestos, soft metals like lead, tin, aluminum and babbitt. In cross-sections the packing may be round, square, wedge or conical.

They may be impregnated with graphite, oils, greases or secret formulas to provide a lubricating film between the surface of the shaft or sleeve and the packing to minimize the friction between the rotating element and the packing. This lubricating quality of the packing is insufficient to permit continued running of the pump without additional lubrication which, most frequently, is oil or water tapped from the pump or supplied from an external source but may be another liquid or grease.

Since a great many centrifugal pump packings have been developed for different applications, it is impossible to list in detail the construction and uses of each variation. The following is to be considered only as a general outline:

Fiber Type Packings—Twisted fiber (Figure 1) is a simple packing suitable only for small pumps without any appreciable pressure on the packing boxes. It is usually graphited and strands may be quickly undone to fit a smaller size box. It is weak and may be easily torn apart.

Part 1 of this series was devoted to construction features and applications of various types of packing boxes and glands. Its purpose was to present the fundamentals of centrifugal pump packings by showing how packing boxes work and the conditions which require different types to be used. The present article indicates the various types of packing that are used in centrifugal pumps, and provides a guide for the selection of the correct packings for the fluid being pumped.

Braided packing has several variations. Its simplest form is the ordinary round or braid-over-braid type (Figure 2). It is built up to the desired diameter by braiding separate covers around a center core. There is no structural bond between the layers so that it is weak. Somewhat of an improvement is the ordinary square braid, Figure 3, where each strand passes over and under other strands running in the opposite general direction. No strands pass entirely through the packing and no single strand is linked with all the other strands so that it is also a weakly constructed packing.

An interlocking or lattice type of braid is made so that every strand passes diagonally through the body of the packing at an angle of 45 degrees, Figure 4. This makes a completely unified structure which is braided *internally* as well as externally. Every strand contributes to the strength of the entire mass. Wear does not loosen the strands. It has unusual flexibility so that large packing sizes may be bent into small diameter rings without distortion of the square cross-section.

Braided packing may be jute, cot-

on, rayon, nylon, flax or for water pplications, ramie may be used.

Metallic braided packing is sometimes the only solution for high temperature applications. It is tough and because it has no resiliency, it cannot handle shaft run-out or whip and it must be well lubricated. Under proper conditions it may wear the shaft less than a fiber packing. An intermediate step is to use a wire-reinforced fiber packing which will impart strength to the fiber strands.

Plastic braided packing of Teflon will show many times the life of other materials in highly corrosive fluids. Since it has a high co-efficient of expansion, a temperature increase may bind it to the shaft. As a suspensoid, Teflon is used to saturate blue and white asbestos to increase their life against water and acids.

Other binders for fiber type packings are natural or synthetic rubber, mineral or fatty oils, wax, white petrolatum, castor oil, shellac, chlorinated or fluorinated lubricants, high flash mineral oil, glycerin, soap or mixtures.

Woven fiber may be wrapped, accordion folded, laminated or pleated. Generally, it is made as a cloth with cotton, brass, monel or other metal wire reinforcement. Where metal reinforcement is present, it is neces-

TABLE 1

Types of Packing to Use With Various Media

Medium	Centrifugal and rotary shafts
Steam High pressure	Asbestos Metallic Semi-metallic Plastic (loose fill)
Steam Low pressure	Asbestos Metallic Semi-metallic Plastic (loose fill)
Water Hot	Asbestos Semi-metallic Plastic (loose fill) Mechanical seals
Water Cold	Asbestos Flax, jute or ramie Cotton or rayon Semi-metallic Plastic (loose fill) Mechanical seals
Gasoline and oils Hot	Asbestos Semi-metallic Plastic (loose fill) Mechanical seals
Gasoline and oils Cold	Asbestos Semi-metallic Plastic (loose fill) Mechanical seals
Air	Asbestos Semi-metallic Plastic (loose fill) Mechanical seals
Gas	Asbestos Semi-metallic Mechanical seals

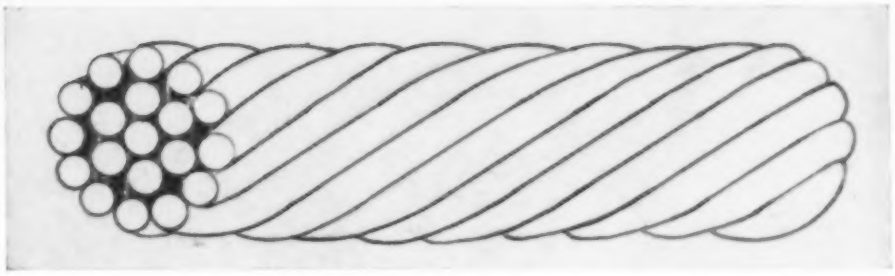


FIGURE 1—Twisted fiber packing for small pumps.

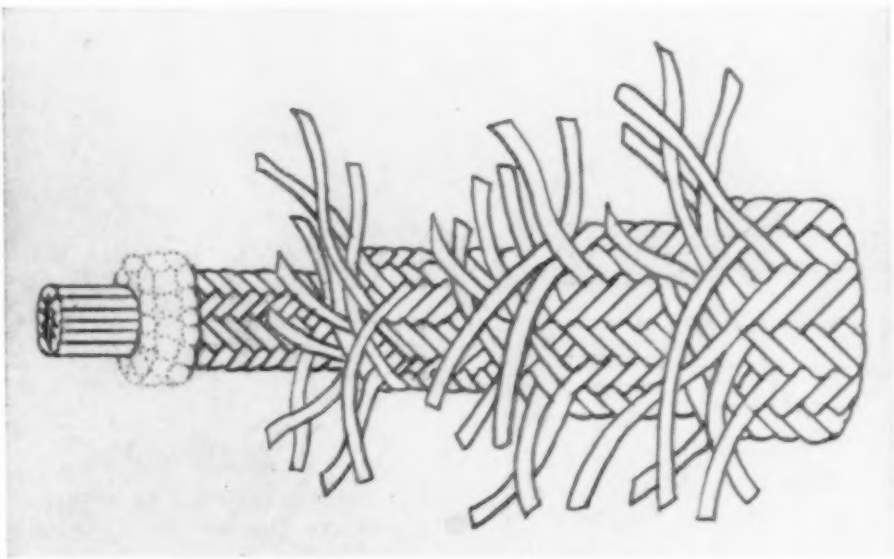


FIGURE 2—Round, braided packing has separate covers around a center core.

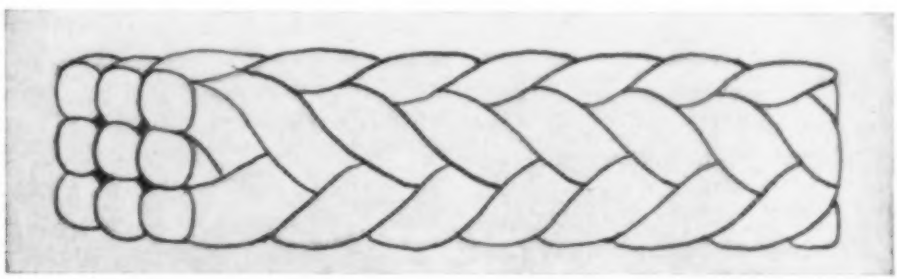


FIGURE 3—Square braid packing provides a better structural bond between the layers.

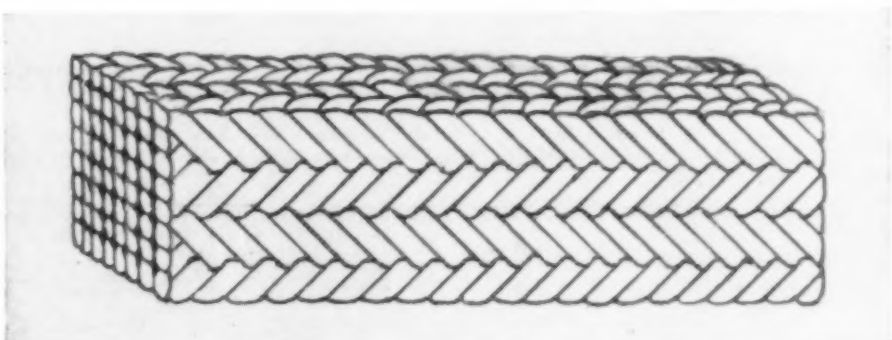


FIGURE 4—Interlocking braid packing provides a unified structure braided internally as well as externally.

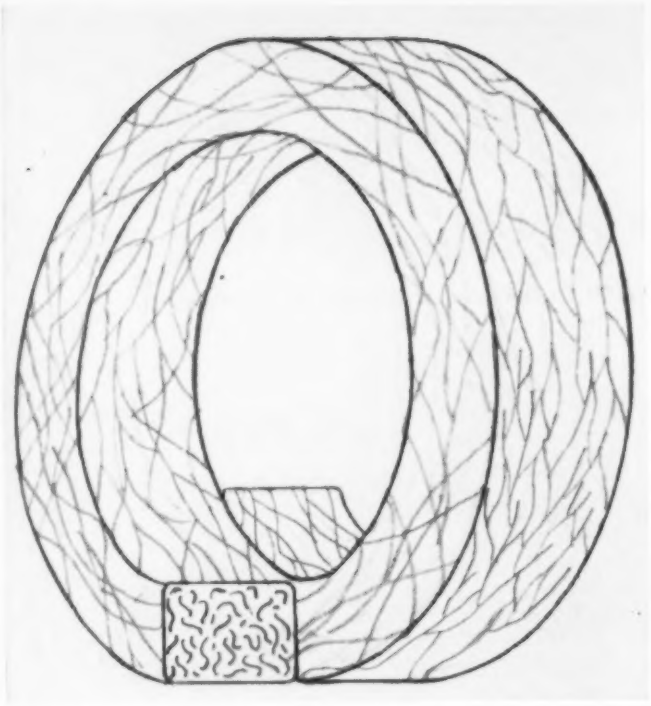


FIGURE 5—Crimped metal packing is made of babbitt lead, copper or aluminum foil ribbons.

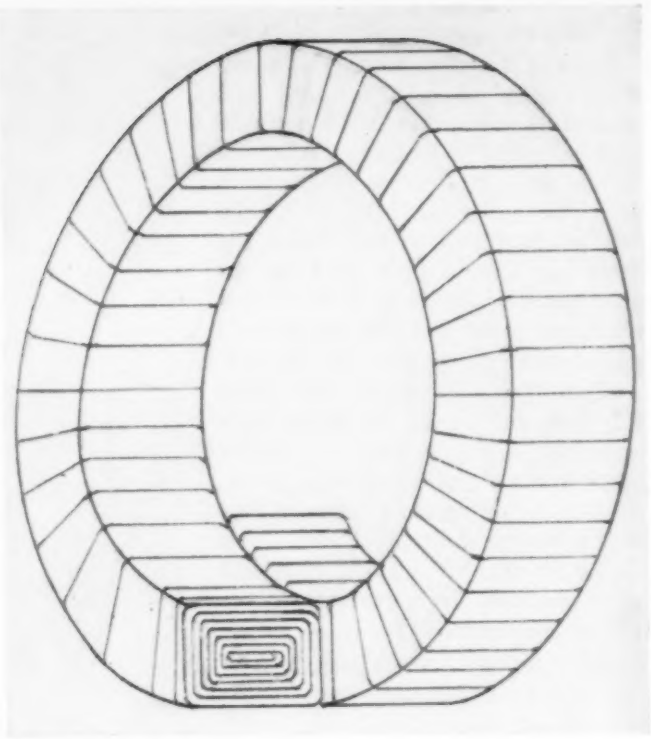


FIGURE 6—Spiral-wound flexible packing consists of layer-over-layer of metallic fold.

sary that hardened or semi-hard shaft sleeves be provided as recommended by the packing manufacturer.

Woven material is porous so it may be impregnated with any of the elements mentioned under braided packing.

Wrapped and accordion folded cloth is usually cemented with a binder to seal porosity and hold folds together.

Generally, woven fiber packings are not designed for centrifugal pump use, although in an emergency many might be so used.

Crimped and Spiral-Wound Metal—Crimped metal packing is made of continuous thin ribbons of foil, usually babbitt lead, copper or aluminum, (up to 800 F), spirally and loosely wrapped, crinkled and folded and squared to desired size, Figure 5. Each layer of foil is lubricated with an oil or graphite so that the voids form lubrication reservoirs.

Spiral-wound flexible packing is made by spirally wrapping thin layers of soft metallic foil, layer over layer, Figure 6. Each layer is lubricated.

The theory of metallic packings is that they form a bearing dense enough to support shaft loads like a regular bearing although they are normally used where the pressure or temperature is too high or the liquid too corrosive for fiber packing.

Some years ago one refinery fire was reported to the API as having been caused by aluminum foil packing.

The theory formulated to describe the sequence of events was as follows: Part of the aluminum foil packing had been ground (by abrasive wear) to a colloidal fineness and so long as this ground aluminum had remained protected from the air by a layer of volatile oil, it had not caused any difficulty. When, however, a small particle of the aluminum metal had been thrown off the shaft or scratched from the body of the packing, the

Table 2—General Guide to Chemical Effect of Various Gases and Liquids on Packing Materials

MEDIUM	Metals	Natural Rubber or GR-S	Neoprene	Buna-N	Thiokol
GASES Air or Oxygen up to 700° F.	Little effect (except lead melts above 600° F.)	Hardens or becomes tacky. May ignite in oxygen	Hardens and decomposes at temperatures above 300° F.	Hardens	Volatile at temperatures above 212° F.
Other Hot Gases except Halogens or Dry Steam	Little or no effect below melting point of metal. Hot compressed hydrogen embrittles steel	Hardens or becomes tacky	Hardens. Decomposes at temperatures above 300° F.	Hardens	Volatile at temperatures above 212° F.
LIQUIDS Water (including all neutral water-soluble salts)	No effect, except iron rusts	No effect except slow swelling	Swells—Especially in fabric constructions	No effect except slow swelling	No effect at temperatures below 212° F. except slow swelling
PETROLEUM Products (Gasoline, etc.)	No effect	Swells excessively	Swells slightly	Swells very slightly	No effect
Oils	No effect except high-sulphur hot oils attack copper, iron and alloys	Swells strongly with cold oils. Reverts and dissolves with hot oils	Swells moderately at temperatures up to 300° F. Decomposes at higher temperatures	Slight shrinkage or swelling depending upon aromaticity of the oil	No effect at temperatures below 212° F.

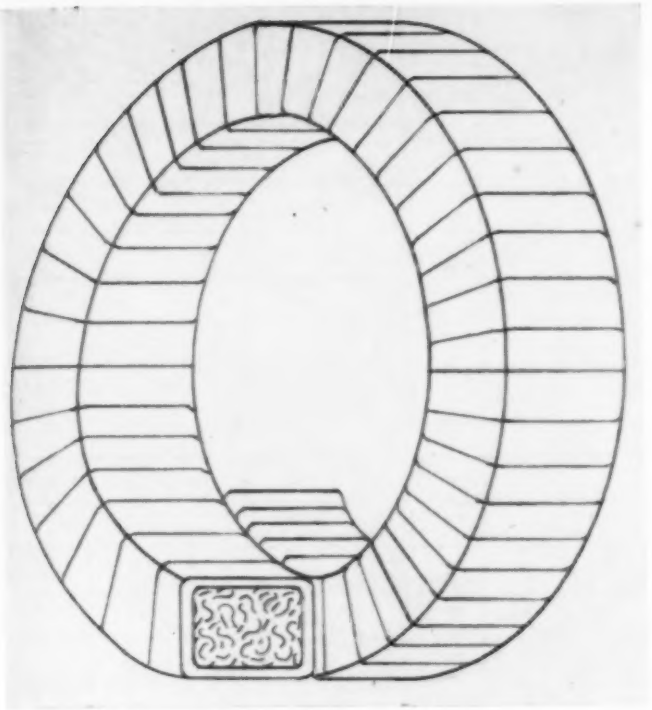


FIGURE 7—Spirally-wrapped packing with a core of lubricated asbestos.

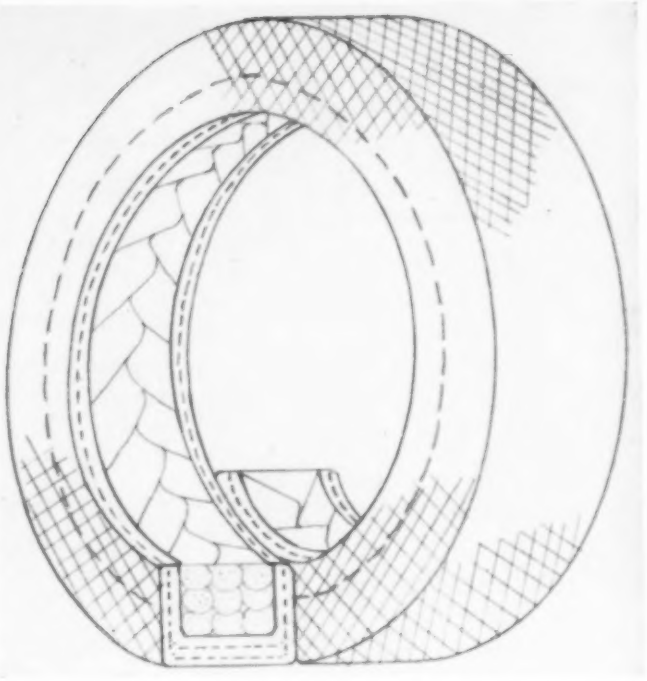


FIGURE 8—Packing with an insert of soft copper wire with a rubber treated, asbestos channel.

dried powder had spontaneously ignited on exposure to the air. As this is the only refinery fire ascribed to this cause, the theory has received little credence.

The substitution of lead and plastic combination packing sets has proven successful for operation below 250° F. But little or no progress has been made in finding a suitable substitute for aluminum in temperatures over 250° F on light hydrocarbon service.

Metal-foil packings are durable but they lack resilience so the shaft or shaft sleeves must run true. Metallic packing must be flexible and compressible. Although it is well saturated with lubricant when being made, it must receive additional lubricant while running either from the liquid being pumped or from an external source through a lantern ring.

The frictional resistance is chiefly from the fluid film so there is less wear than with fiber types.

To improve resilience and increase the lubrication carrying capacity metallic packings are combined with various soft cores. Figure 7 shows a spirally-wrapped, thin ribbon, soft babbitt foil with a core of lubricated asbestos. Figure 8 shows a combination where the core is an insert of soft annealed braided copper wire fastened to an oil-proof, synthetic rubber treated, asbestos channel. This type is used for tar and asphalt centrifugal pumps; but the channel types, with their various core materials, are more generally used with reciprocating pumps.

Table 1 lists the different kinds of packing to use with various media.

Table 2 is intended only as a general guide to the chemical effect of various gases and liquids on the materials commonly used in packings. The mechanical properties of the packing are of equal importance so that selection of a packing should not be based solely on chemical consideration.

ACKNOWLEDGMENT

The information contained in the tables is published through the courtesy of the Garlock Packing Company, Palmyra, New York.

Part 3 will appear in an early issue of Pipe Line Industry.

Silicone	Phenolic Resins	Teflon	Asbestos	Blue Asbestos	Cotton, Flax Viscose Rayon	Paper	Leather
No effect except slow hardening. Decomposes at temperatures above 500° F.	Little effect	No effect	No effect	No effect	Weakens and may ignite above 300°F.	Becomes weak and brittle above 212° F. Ignites in oxygen.	Hardens. May ignite in oxygen.
Softens. Decomposes in steam	No effect	No effect	No effect	No effect	Weakens at temperatures above 212°	Becomes weak and brittle at temperatures above 212° F.	Hardens at temperatures above 212° F.
Swells and eventually decomposes-rate depending upon temperature	Very slight swelling	No effect	Tendency to disintegrate in absence of waterproof binder	Tendency to disintegrate in absence of waterproof binder	No effect unless superheated	Disintegrates	Loses waxes. Shrinks and hardens on drying
Slight swelling	No effect	No effect	No effect	No effect	No effect	No effect	Loses waxes, shrinks and hardens
Moderate swelling	No effect	No effect	No effect	No effect	Weakens at temperatures above 212° F.	No effect at temperatures below 212° F.	Loses waxes and tends to become porous. Hardens at temperatures above 212° F.

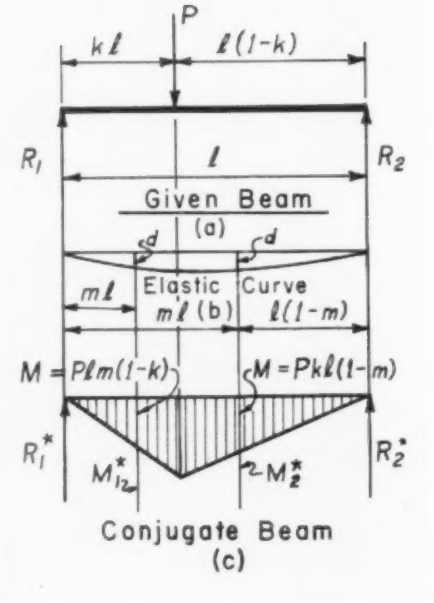


FIGURE 11—Given and Conjugate beam under concentrated load.

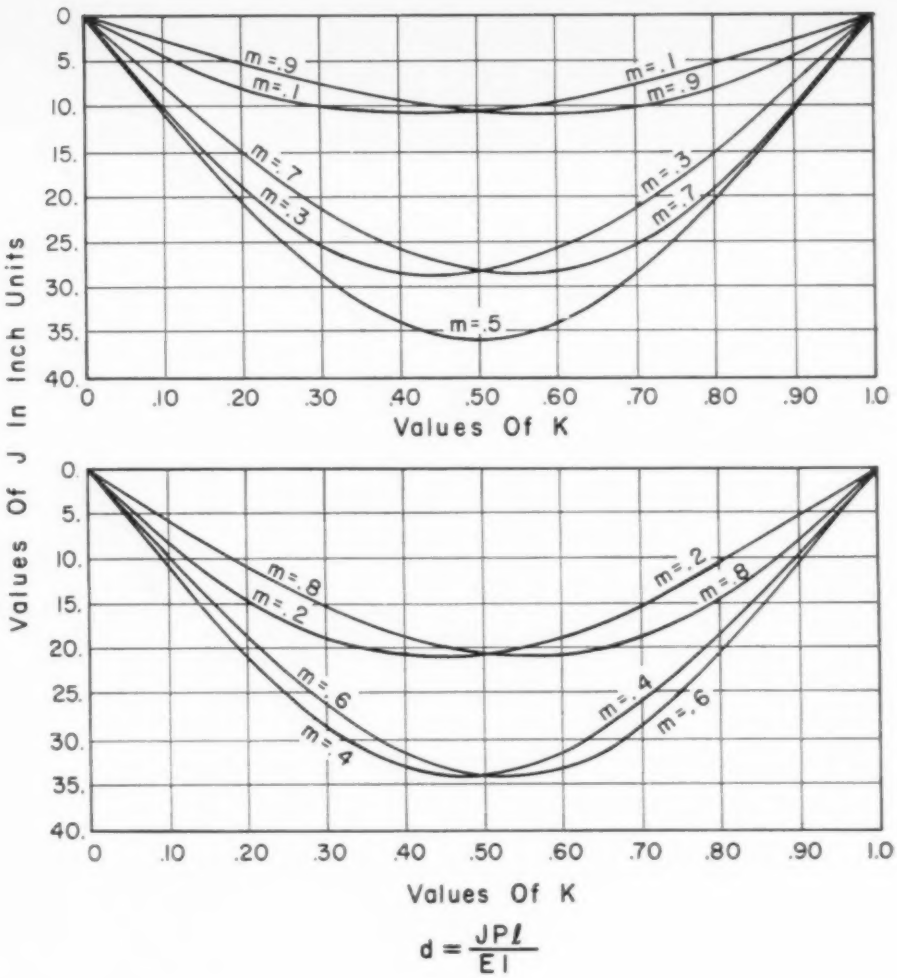


FIGURE 12—Deflection coefficients for concentrated load on simple beam.

$$d = \frac{JP\ell}{EI}$$

Find Beam Deflections by Easy Methods

Simple and cantilever beams with concentrated loads are no problem using this easy method of determining deflection.

By CHARLES H. FORK
The Ralph M. Parsons Company
Los Angeles

THE PREVIOUS part of this series described simple methods of determining the area of moment diagrams and the deflection at any point of a simple beam reacting to a uniform load. This article will describe methods for determining the deflection at any point of a simple beam reacting under a concentrated load and the deflection of a cantilever beam when a concentrated load is applied at any point over the span.

Deflection of Simple Beam—To determine the deflection at any point of a simple beam reacting under a concentrated load, the moments must first be derived.

The moment to the left of the load (Figure 11c) is determined as follows:

$$R_1^* = \frac{Pf}{2}(k - k^2) \times \frac{l}{3}(2 - k)/l$$

$$= \frac{Pf}{6}(k - k^2)(2 - k)$$

$$\text{or } R_1^* = Pf \times \frac{1}{6}(2k - 3k^2 + k^3)$$

$$R_2^* = \frac{Pf}{2}(k - k^2) \times \frac{l}{3}(1 + k)/l$$

$$= \frac{Pf}{6}(k - k^2)(1 + k)$$

PART 2

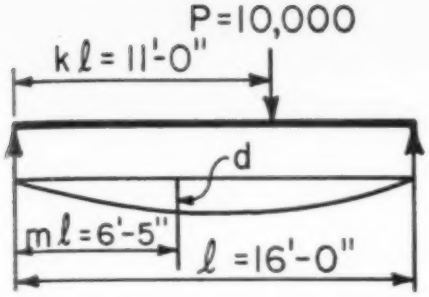


FIGURE 13—Example.

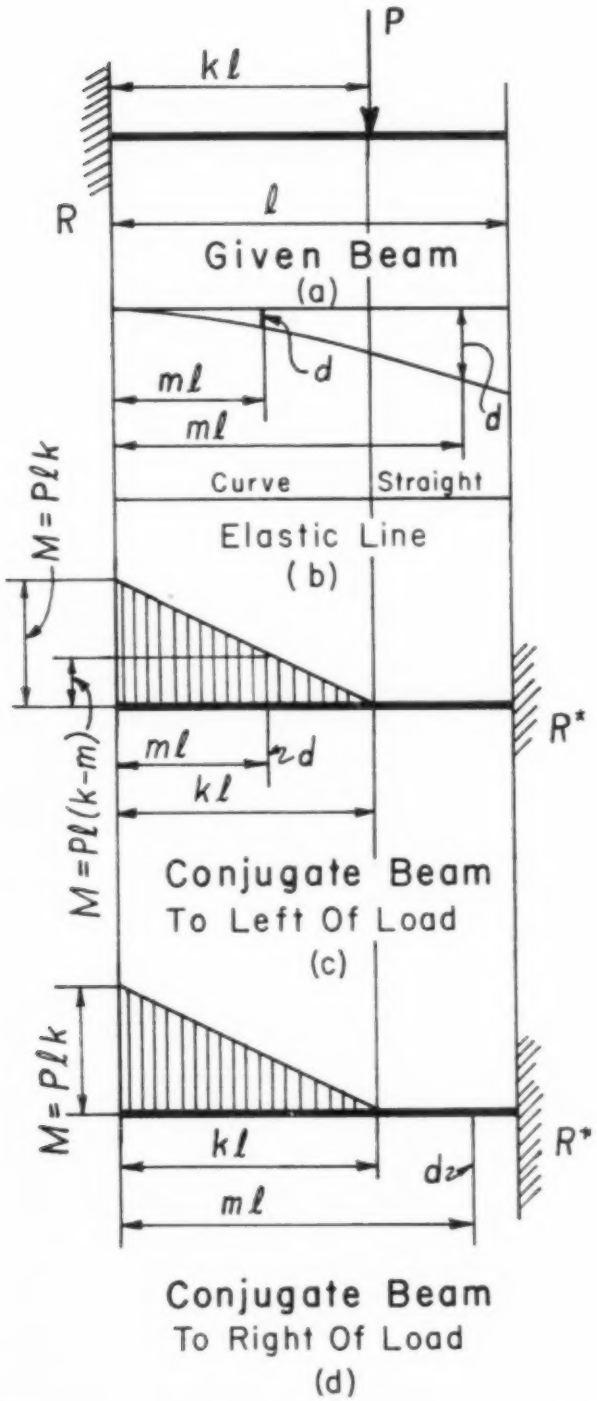


FIGURE 14—Given and Conjugate beam under concentrated load on cantilever beam.

$$\text{or } \overset{*}{R_2} = P\ell^2 \times \frac{1}{6}(k - k^3)$$

Multiplying the coefficients of $P\ell^2$ in the above equations by 144; thus reducing them to inch units, and also representing these expressions by L_1 and L_2 respectively:

$$\text{Then } L_1 = \frac{144}{6}(2k - 3k^2 + k^3)$$

$$L_2 = \frac{144}{6}(k - k^3)$$

$$\text{Also } \overset{*}{R_1} = L_1 P\ell^2$$

$$\overset{*}{R_2} = L_2 P\ell^2$$

$$\overset{*}{M_1} = \overset{*}{R_1} m\ell - P\ell m\,(1 - k)\,m\ell/2 \times \frac{1}{3} m\ell$$

$$= \frac{P\ell^2}{6}(2k - 3k^2 + k^3)\,m - \frac{P\ell^2}{6}(1 - k)\,m^3$$

$$\overset{*}{M_1} = P\ell^2 \frac{1}{6}[(2k - 3k^2 + k^3)\,m - (1 - k)\,m^3]$$

. . . . . Equation 11

The moment to the right of the load (Figure 11c) is determined as follows:

$$\overset{*}{M_2} = \overset{*}{R_2} l\,(1 - m) - P l k\,(1 - m) \times l\,(1 - m)/2 \times \frac{1}{3} l\,(1 - m)$$

$$= \frac{P\ell^2}{6}(k - k^3)\,(1 - m) - \frac{P\ell^2}{6} \times k\,(1 - m)^3$$

$$\overset{*}{M_2} = P\ell^2 \frac{1}{6}\left[(k - k^3)\,(1 - m) - k\,(1 - m)^3\right]$$

. . . . . Equation 12

Multiplying the coefficients of $P\ell^3$ in Equation 11 and 12 by the cube of 12; thus reducing to inch units, and letting "J" denote the following:

To the left of the load— $J = \frac{1728}{6} \times [(2k - 3k^2 + k^3)\,m - (1 - k)\,m^3]$

To the right of the load— $J = \frac{1728}{6} \times [(k - k^3)\,(1 - m) - k\,(1 - m)^3]$

$$\text{Then } \overset{*}{M} = JP\ell^3$$

$$\text{and } d = \frac{JP\ell^3}{EI}$$

. . . . Equation 13

Values of "J" have been computed for values of k and

TABLE 5

Table of Values of Deflection Coefficients for Concentrated Load on Simple Beam

TABLE OF VALUES OF J

m \ k	.1	.2	.3	.4	.5	.6	.7	.8	.9
.1	4.67	8.06	10.08	10.89	10.66	9.56	7.78	5.47	2.82
.2	8.06	14.75	18.95	20.73	20.45	18.43	15.03	10.6	5.47
.3	10.08	18.95	25.4	28.5	28.5	25.9	21.25	15.03	7.78
.4	10.89	20.73	28.5	33.18	33.99	31.33	25.9	18.43	9.56
.5	10.66	20.45	28.5	33.99	36.0	33.99	28.5	20.45	10.66
.6	9.56	18.43	25.9	31.33	33.99	33.18	28.5	20.73	10.89
.7	7.78	15.03	21.25	25.9	28.5	28.5	25.4	18.95	10.08
.8	5.47	10.6	15.03	18.43	20.45	20.73	18.95	14.75	8.06
.9	2.82	5.47	7.78	9.56	10.66	10.89	10.08	8.06	4.67

Note: Values of "J" are in inch units. Divide by 1728 for foot units. Thus, when k = .5 Σ m = .5, $J = \frac{36}{1728} = \frac{1}{48}$ or $d = \frac{1}{48}\frac{P\ell^3}{EJ}$

m ranging from 0 to 1.0, and are found in Table 5 and are shown on the graph in Figure 12.

Example: Determine the deflection 6′-5″ from the left support for a load located 11′-0″ from the left support, l = 16′-0″, E = 30,000,000, and I = 85. (Figure 13.)

$$k = \frac{11'\text{-}0''}{16'\text{-}0''} = .69,\ m = \frac{6'\text{-}5''}{16'\text{-}0''} = .4$$

Then from Figure 12, J = 26.5 and $d = \frac{JPl^3}{EI}$

$$d = \frac{26.5 \times 10{,}000 \times (16'\text{-}0'')^3}{30{,}000{,}000 \times 85} = .424''$$

Deflection of Cantilever Beam—To determine the deflection of a cantilever beam when a concentrated load is applied at any point over the span, find the moments first, for the given beam. If the reaction is P, the bending moment at the support is Plk.

On a cantilever beam, the support for the conjugate beam is placed on the opposite end to that of a given beam, so that the moment and shear of the conjugate beam are zero at the same point that the deflection and slope are zero in the given beam. Also, where the moment and shear are a maximum in the conjugate beam, the deflection and slope are a maximum in the given beam.

The conjugate bending moment at any point to the left of the load between 0 and kl from the left end (See Figure 14c.) is:

$$d = \frac{M^*}{EI},\ \ominus = \frac{R^*}{EI} = \frac{Pl^2k^2}{2EI}$$

$$M^* = [Pl k - Pl\,(k - m)]\frac{ml}{2} \times \frac{2}{3}\,ml + Pl\,(k - m)\,ml \cdot \frac{ml}{2}$$

$$\text{or } M^* = Pl^3\left[\frac{m^3}{3} + \frac{m^2}{2}\,(k - m)\right] \quad \text{. . . . . Equation 14}$$

The conjugate bending moment to the right of the load is:

M* at any point to the right of the load between kl and l. See Figure 14d.

$$M^* = Pl k \times \frac{kl}{2}\left(ml - \frac{kl}{3}\right)$$

$$\text{or } M^* = Pl^3 \cdot \frac{k^2}{2}\left(m - \frac{k}{3}\right) \quad \text{. . . Equation 15}$$

Let Q represent the coefficients of Pl^3 in Equations 4 and 5. Also, multiply the equation by 1728 which reduces the equation to inch units.

$$Q = 1728\left[\frac{m^3}{3} + \frac{m^2}{2}\,(k - m)\right] \text{ To the left of the load}$$

$$Q = 1728\left[\frac{k^2}{2}\left(m - \frac{k}{3}\right)\right] \text{ To the right of the load}$$

$$\text{Then } d = \frac{QPl^3}{EI} \quad \text{. . . Equation 16}$$

Values of Q are calculated in Table 6 for the value of k and m varying from 0 to 1.0. These values are also plotted on Figure 15. The curves are influence lines for the deflection as the load moves over the span.

Example: Determine the deflection of a cantilever beam 16′-0″ from the support for a load of 10,000 pounds, located 14′-0″ from the support. E = 30,000,000, I = 724.4. See Figure 16.

$$k = \frac{14'\text{-}0''}{20'\text{-}0''} = .7,\ m = \frac{16'\text{-}0''}{20'\text{-}0''} = .8$$

From Table 6: Q = 240 $d = \frac{QPl^3}{EI}$

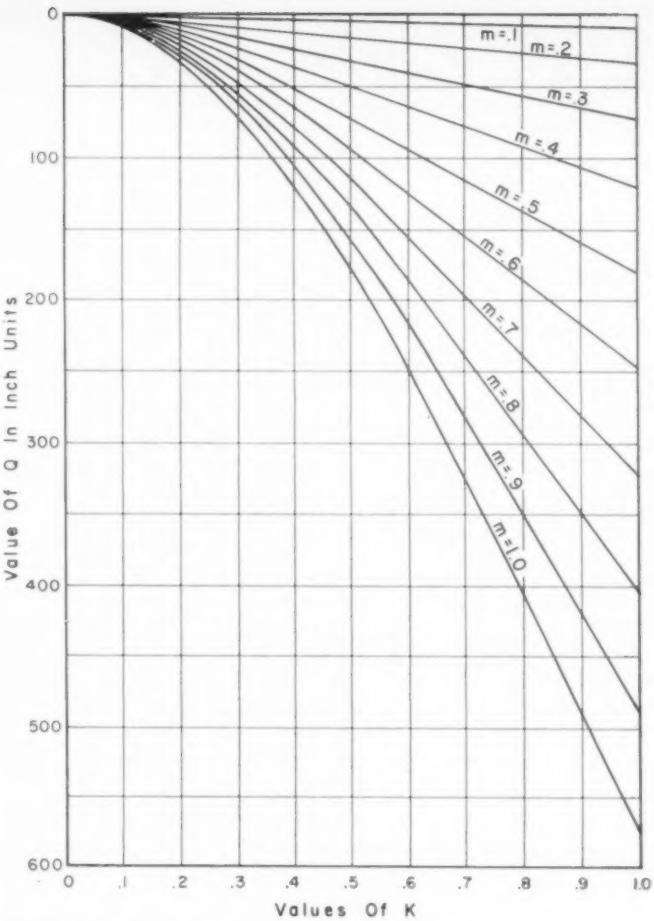


FIGURE 15—Deflection coefficients for concentrated load on cantilever beam.

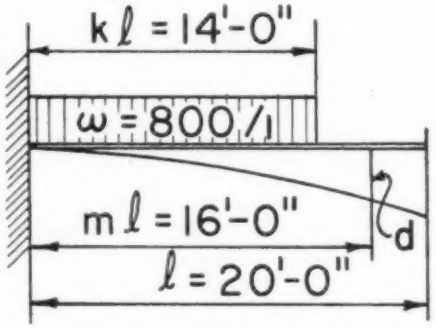


FIGURE 16—Example.

TABLE 6
Table Values of Deflection Coefficients for Concentrated Load on Cantilever Beam

TABLE OF VALUES OF Q

m \ k	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
.1	.576	1.44	2.30	3.16	4.03	4.89	5.76	6.62	7.48	8.35
.2	1.44	4.67	8.13	11.59	15.04	18.5	21.95	25.41	28.87	32.32
.3	2.30	8.13	15.55	23.33	31.11	38.89	46.67	54.45	62.23	70.01
.4	3.16	11.59	23.33	36.81	50.63	64.45	78.27	92.09	105.91	119.73
.5	4.03	15.04	31.11	50.63	72.06	93.66	115.26	136.86	158.46	180.06
.6	4.89	18.5	38.89	64.45	93.66	124.42	155.52	186.62	217.72	248.82
.7	5.76	21.95	46.67	78.27	115.26	155.52	197.51	239.85	282.19	324.53
.8	6.62	25.41	54.45	92.09	136.86	186.62	239.85	294.97	350.27	405.57
.9	7.48	28.87	62.23	105.91	158.46	217.72	282.19	350.27	419.90	489.88
1.0	8.35	32.32	70.01	119.73	180.06	248.82	324.53	405.57	489.88	576.0

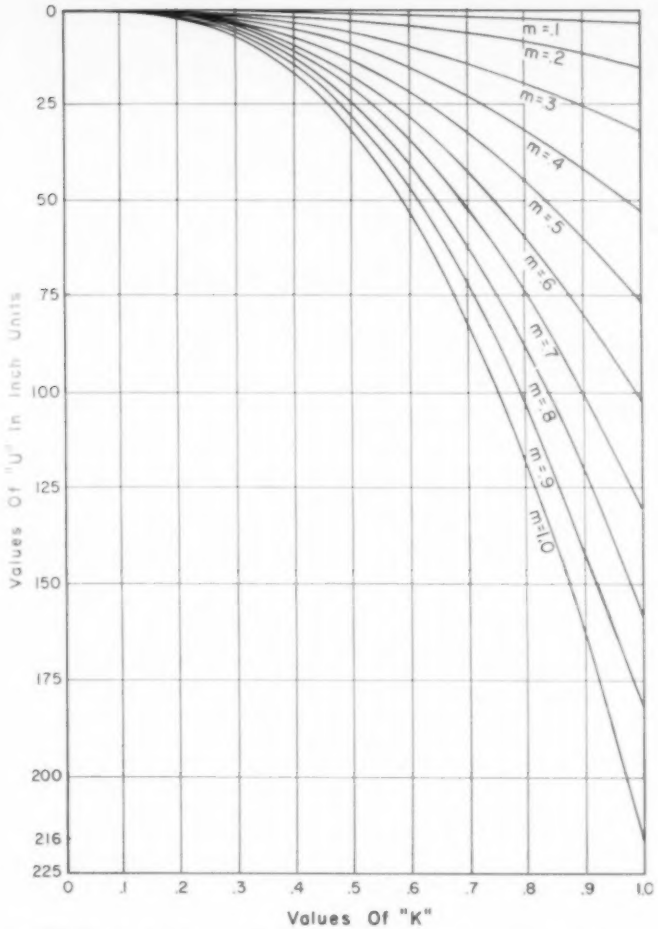


FIGURE 17—Deflection coefficient for uniform load on cantilever beam.

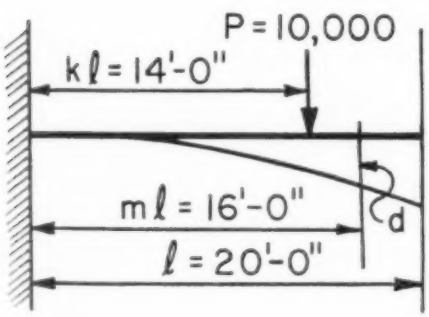


FIGURE 18—Example.

$$\text{Therefore, } d = \frac{240 \times 10{,}000 \times 20^3}{30{,}000{,}000 \times 724.4} = .882''$$

To determine the deflection of a cantilever beam reacting under a uniform load, the derivation is as follows:

The given beam is: $M = \frac{w}{2}(kl - x)^2$

Case 1—The deflection at any point under load.

Conjugate beam:

Let ml represent the point of deflection under load. The differential moment for the conjugate beam is:

$$d\overset{*}{M} = M dx \cdot (ml - x)$$

$$= \frac{w}{2}(kl - x)^2 (ml - x)$$

$$\overset{*}{M} = \frac{w}{2}\int_0^{ml} k^2m^2l^2 - (2km^2l^2 + k^2l^2)x + (ml + 2kl)x^2 - x^3$$

Integrating:

$$\overset{*}{M} = \frac{w}{2}\left[k^2m^2l^2x - (2km^2l^2 + k^2l^2)\frac{x^2}{2} + (ml + 2kl)\frac{x^3}{3} - \frac{x^4}{4}\right]_0^{ml}$$

Substituting ml for x and factoring, the following result is obtained.

$$\overset{*}{M} = \frac{wl^4}{8}\left[2k^2m^2 - \frac{4}{3}km^3 + \frac{m^4}{3}\right] \quad \text{... Equation 17}$$

Case 2—Deflection at any point beyond the end of the load. For this case, let ml represent the point of deflection beyond the load. Using the same integral as above, and substituting for this case between the limits of kl and 0.

$$\overset{*}{M} = \left[k^2m^2l^2x - (2km^2l^2 + k^2l^2)\frac{x^2}{2} + (ml + 2kl)\frac{x^3}{3} - \frac{x^4}{4}\right]_0^{kl}$$

Substituting kl for x and factoring, the following result is obtained.

$$\overset{*}{M} = \frac{wl^4}{6}k^3\left[m - \frac{k}{4}\right] \quad \text{... Equation 18}$$

Letting "U" represent the coefficients of wl^4 in Equations 17 and 18, and also multiplying by the cube of 12 (1728) to reduce to inch units:

$$U = \frac{1}{8}\left[2k^2m^2 - \frac{4}{3}km^3 + \frac{m^4}{3}\right]1728 \quad \text{Under load}$$

$$U = \frac{1}{6}k^3\left[m - \frac{k}{4}\right]1728 \quad \text{Beyond end of load}$$

$$\text{Then } \overset{*}{M} = Uwl^4$$

$$\text{And Deflection } d = \frac{Uwl^4}{EI}$$

Values of U are found in Table 7 and are also plotted on Figure 17 for values of k varying from 0 to 1.0.

TABLE 7

Table Values of Deflection Coefficients for Uniform Load on Cantilever Beam

TABLE OF VALUES OF U

m \ k	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
.1	.022	.121	.309	.584	.942	1.39	1.92	2.54	3.24	4.04
.2	.050	.346	.973	1.95	3.28	4.95	6.95	9.34	12.0	15.1
.3	.079	.576	1.75	3.78	6.42	9.92	14.2	19.2	25.1	31.7
.4	.107	.807	2.53	5.53	9.92	15.7	22.8	31.3	41.3	52.5
.5	.137	1.04	3.31	7.38	13.5	21.8	32.2	44.8	60.0	76.5
.6	.166	.127	4.08	9.50	17.1	27.9	42.0	59.1	79.4	103.0
.7	.194	1.50	4.85	11.0	20.7	34.1	51.8	73.5	99.6	130.5
.8	.223	1.73	5.65	12.9	24.1	40.5	61.6	88.5	118.5	158.0
.9	.254	1.96	6.43	14.7	27.9	46.7	71.5	103.2	141.5	186.5
1.0	.281	2.18	7.18	16.6	31.5	52.5	81.6	117.8	162.6	216.0

Example: Determine the deflection at a point 16'-0" from the support loaded as in Figure 18. E = 30,000,000 and I = 724.

$$k = \frac{14'\text{-}0''}{20'\text{-}0''} = .7, \qquad m = \frac{16'\text{-}0''}{20'\text{-}0''} = .8$$

From Table 7 or Figure 17, k = .7, m = .8, U = 61.6

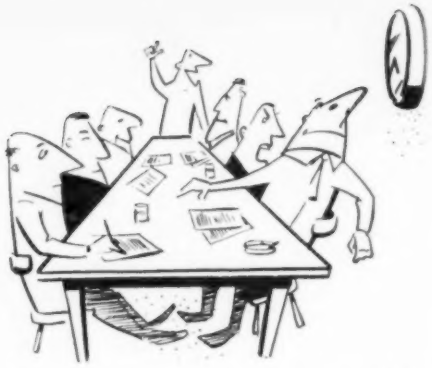
$$d = \frac{61.6 \times 800 \times 20^4}{30{,}000{,}000 \times 724} = .373''$$

Part 3 will appear in an early issue of PIPE LINE INDUSTRY

ACKNOWLEDGMENT

From a privately circulated book by Charles H. Fork entitled "Structural Design Data on Deflection of Beams" upon which the author holds the copyright.

Make Those Minutes Count!



Many executives are getting increasingly suspicious that this business of meetings is being overdone.

Here are the deadliest time-killers in your office . . . and some excellent suggestions on how to reform the culprits.

By ROBERT E. JOHNSON, United Air Lines, Chicago

ONE OF THE GREAT problems confronting management is the proper application of time. An 8-hour office day has only 480 minutes. But the average executive's work day is more than eight hours. However, if he is to be more productive, he must make the most of the office time available to him.

From one viewpoint the very offices in which executives work represent obstacle courses in the path of increased management efficiency. The first element in an office that can create trouble is the desk.

Most executives have desks, most believe they need them in the transaction of their business, and perhaps that's so. Executives make a bee-line for the desk when they reach the office, and because it represents a symbol of office life, have a tendency to spend too much time in that one spot. As a result many executives are unable to accomplish some very important aspects of management responsibilities.

We all know that a desk is a trap for paper work. As long as a desk has a drawer or several drawers it's going to accumulate papers. Many executives practice the experiment from time to time called "cleaning out our desk" and it's always a revelation to discover how unimportant some of the material in the desk has become when on receipt it appeared so vital.

Some executives get around this problem by not using a desk. They found by using lounge furniture in their offices and perhaps a telephone table they've been able to escape some of the problems that are created by the desk. But whether you get rid of a desk or not is immaterial. The main point, and this is step one in the elemental do-it-yourself, is to recognize that you must be master of your desk rather than servant.

That Goes for Letter Baskets, too. The next familiar piece of equipment in our offices is what we might call the letter basket. It can be a letter box on the desk, it can be a drawer on the desk. It can be the folder that the secretary brings in, but it represents business correspondence and that represents another deterrent to maximum efficiency of management action.

Many executives have assistants and secretaries who are very helpful in screening out correspondence, in handling minor matters, in passing up only those things which require policy or action at management level. But correspondence is an insidious thing and unless guarded against, the executive will find he is spending more of those 480 minutes a day in correspondence that might well be delegated.

Another sore point is the abuse of correspondence that takes place. About two months ago our company conducted a very interesting experiment. We collected from the mailing department all of the mimeographed material, all of the sales bulletins, all of the reports that were sent out during the period of one week to our sales offices in the field, and that made quite a pile.

But as we went through that pile with the managers and supervisors who were responsible for creating that flood of paper to the field, we found that 50 percent of that material could either have been eliminated or pruned substantially! Yet it was

Another sore point is the abuse of correspondence that goes on.

The Telephone—the third, and most time-consuming piece of office furniture.

About the Author

ROBERT E. JOHNSON, vice president and assistant to the president of United Air Lines, is an aviation industry veteran. He began his airline career in 1929 with the Boeing Airplane Co. In 1938, Johnson became director of advertising and publicity for United. In 1951, he was elected a vice president of United in charge of public relations, publicity and advertising activities. In 1953, he also assumed direction of United's sales administration. He was elected to United's board of directors in 1954.

eating up valuable time in its production and valuable time in the field. By the same token we examined the reports coming in from our sales offices in the field and found that a high percent were reports that no longer fulfilled their original purpose and others were susceptible to modernization.

These are three excellent solutions to the letter box bottleneck. Delegate as much correspondence as possible —handle what can be handled promptly—cut out unnecessary correspondence.

Then There's the Telephone. The third, and most time consuming piece of office furniture, is the telephone. We can't do business today without the telephone much as some of us would like to try it from time to time. But we can do business more efficiently by recognizing the danger that's inherent in the time lost every time it rings.

Executives understand the problem created by the interruption feature of the telephone. They might be engaged in creative thinking and then find the telephone calls interrupt and disturb their thought trends. Some executives deal with the pesky problem by shutting off the telephone from time to time. But this is not always practical. The most important thing to bear in mind is that it's so easy to waste time on a telephone and also so easy to make unnecessary calls. That takes time and money.

Let's give a quick example of how the telephone by its very convenience can create unnecessary telephone traffic. One company links its executive offices in Chicago with its operating headquarters in Denver, and its maintenance headquarters in San Francisco, with a direct private telephone line. Recently I placed a call in the early part of the afternoon for one of our officials in Denver and my secretary informed me that there were 18 calls ahead of me, and if I wanted the call completed that day I should make it outside by long distance.

Because I was interested in the subject of streamlining the executive workload I asked the switchboard if, in routine fashion, she would check the supervisors to find out if the purpose of the calls could be served equally well by telegram or even an air mail letter. As a result of that survey 12 out of the 18 calls were cancelled. That illustrates the temptation of the telephone.

Discourage Visiting Firemen. The fourth piece of time wasting office equipment is the visitor's chair. That is a very essential piece of any office furniture. If it's not being used, if it's getting dusty then we can become disturbed over our own business progress. But the fact remains, many occupants of the visitor's chair are not sensitive to the value of the time of the gentlemen on whom he is calling.

A book recently published called "How to Gain An Extra Hour Every Day" by Ray Josephs recognizes the problem of inroads on executives' time by people who come in without a concise businesslike presentation of the point of the interview. One of the author's suggestions to deal with that type of situation is to look at the ceiling or out the window occasionally.

The main thing is that if we recognize the attrition in time represented over the year by the visiting firemen, polite as we may be to them, we must then develop a more businesslike desk side manner.

Clock Your Conferences. Finally there's one other element of the executive's office that deserves attention —the conference table.

In this modern day of American business a many actioned group discussion of plans and policies has become essential, and obviously along with that we have the conference table. A lot of executives are getting increasingly suspicious that this business of meetings is being overdone.

Fundamentals Involved. Now let's take a look at some of the real fundamentals involved in this question of

streamlining the executive work load.

First is the very organization in which we work. Even though the organization of one company and another may differ, fundamentally they're tailored to the concept of concentration of policy and authority and decentralization of work.

We all have our organizations, we have our assistants, we have our staff —but we are not using, in all cases, the organizations which have been tailored to our needs, as we should use them. This business of delegation is a much talked about, but very sensitive area.

If an executive is really interested in checking whether an item should be delegated it can be subjected to certain questions such as these:

1. Is it a policy item?
2. Is it repetitive or retained?
3. Are there subordinates who have the ability and all the facts to make this type of decision?
4. Is there really a choice? Can he even consider spending time on this area in relation to other items of far greater importance?

One type of business philosophy which always lightens the executive work load requires a change in approach on the executive's part from participating fully in every activity to concentrating on developing measurements which will get across to his people what he expects of them, and then a simple report on how well they are doing.

Communications. Another point involved in this matter of executive streamlining is communications. We all know that a well-informed organization is a more productive organization, but sometimes we forget about it and sometimes we make work for ourselves by our failure to communicate the philosophy of our policies and plans to those whom we expect to execute them. Sometimes we can save time by properly communicating information on what we want done at the time we make the delegation. In other words delegation means communication as an important adjunct.

To insure that you are doing your share in streamlining the executive work load—make this simple little check—"Have you some time each day to relax in your office and get some perspective on the over-all problems ahead?" —**The End**

If Oil Could Speak

If oil could speak it would have many fascinating truths to tell the non-oil public—truths that would win thousands of new friends for the oil industry.

But, oil can't speak—you can. You, as an individual, can win many new friends for the oil industry if you will pass the true facts on to your non-oil industry friends.

Here are some of those true facts. They are being presented for one purpose: To keep you posted on your industry, so you can tell the story oil is unable to relate.

Read these facts. You will find them informative—and interesting.

"If Oil Could Speak" it would tell the American public:

•

• Last year, the oil industry paid more local, state and federal taxes than any other industry—nearly $5.5 billion, excluding employe income taxes. The oil and gas industry paid Texas $191 million in taxes last year—about one-third of all tax and license revenues paid by industry and business in the state.

•

• In a recent survey, three out of four people thought most of the oil refining done in this country was by three or four large companies. The truth is, the four largest companies do only 37.3 percent of the oil refining, and this ratio is smaller than it was in 1930.

•

• One-fifth of the world's 57 million square miles of land area has oil potential. Of that one-fifth, much less than another one-fifth is located in the U. S. Yet the U. S. has produced 60 percent of all the oil produced to date. Last year alone, our oil producers achieved an output of more than 7 million barrels a day. Private enterprise did it, competition speeded it up.

•

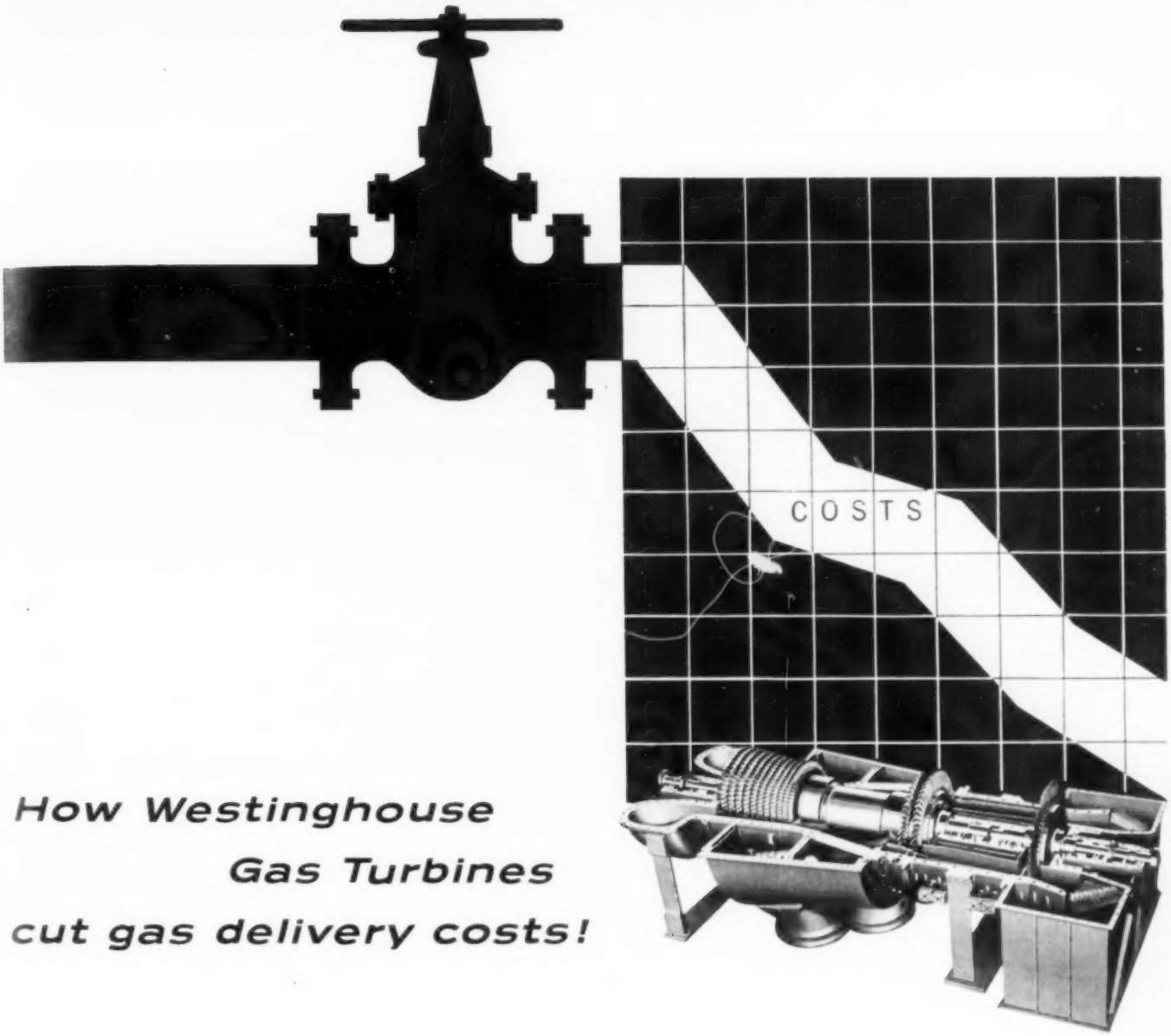
• We are not running out of oil. During the first ten months of 1956, U. S. oil companies discovered more than 1193 new fields, of which 901 were oil and 292 were gas and distillate.

•

• Twenty-five years ago, proved reserves *worldwide* were estimated to be equal to 15 years of production at the 1931 rates. Now the world production rate is four times what it was in 1931, yet exploration has been so successful that present reserves are equal to 33 years at present rates. Again, private enterprise and competition have been responsible for nearly 100 percent of our oil discoveries.

•

Remember: Oil can't speak—you can. Only you can give the non-oil public the true facts about your oil industry.



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Lower initial cost—based on unit horsepower, not considering the extra 25% during cold weather. And, usually, no reduction gear is needed.

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Simple maintenance—Lifting the cover exposes the entire gas turbine for inspection . . . a feature pioneered by Westinghouse.

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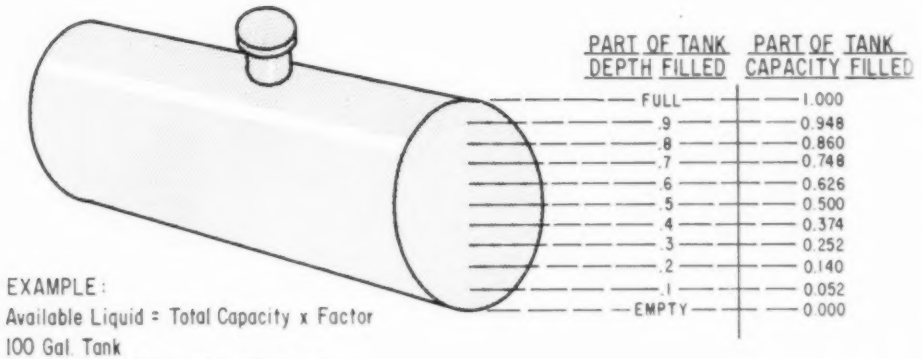


EXAMPLE:
Available Liquid = Total Capacity x Factor
100 Gal. Tank
0.4 Full = 0.374 x 100 = 37.4 Gal.

Miscellaneous —34—Estimate Volume of Liquid in Horizontal Cylindrical Tank

It is often necessary to estimate the amount of fuel, water or other liquid remaining in a cylindrical tank on the job.

The above table will give a reasonably close approximation for any size tank of this nature. A gag-stick, graduated in "tenths" of the total depth, can be prepared in the field when needed.

If the tank in the example above had 200 gallons "full" capacity, the result would be (0.4 full):

$0.374 \times 200 = 74.8$ gal. liquid available.

Engineering Design —31—Head Loss Charts for Various Sizes of Pipe

The Friction Loss Characteristics for 4-inch line pipe, as shown on Page 69, were developed by a pipe line company to meet its needs in system design after experimenting with the subject for many years. The characteristics are based on the use of Hydraulic Institute data and are plotted on a head-throughput basis for various viscosities purely for convenience in use.

Use of units—Saybolt Seconds Universal (Viscosity) and Feet (head) are also used as a matter of convenience. Each characteristic is divided into three parts as is illustrated by the "100 SSU Characteristic": (1) Laminar Flow—the solid portion between 29 BPH and 53 BPH; (2) Critical Zone Flow—the broken line between 53 BPH and 415 BPH; and (3) Transition Zone through complete turbulence at throughputs above 415 BPH.

It has been found that the use of this data in the laminar and critical zones is adequate for estimates. Friction losses based on Transition and Complete Turbulance Zones are very accurate and reliable in flow predictions.

Example:

Given: 460 BPH
Viscosity 100 SSU, Specific Gravity = 0.81
4" line pipe, 4,200 feet in length.

Required: Pressure required to pump liquid at given conditions.

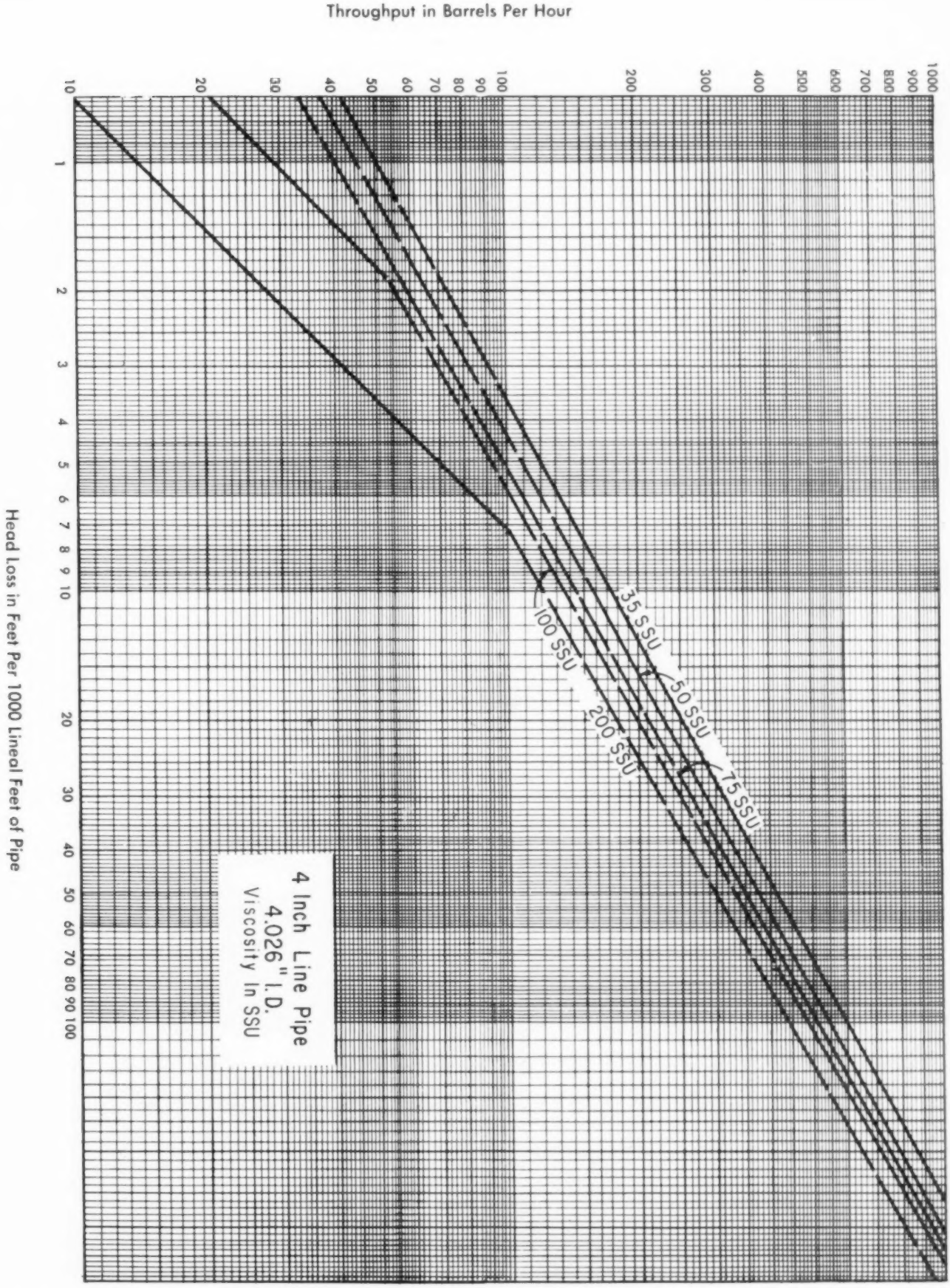
Solution: (1) By observing the "100 SSU characteristic for 4-inch line pipe," where it intersects the ordinate, 460 BPH, it can be determined that there is a friction loss of (4.2) (93) = 390 feet is to be overcome. This head, converted to pounds per square inch = 140 psi. due to friction loss.

Friction losses for viscosities lying between the characteristics shown can be determined by interpolation.

This chart is one in a series of nineteen to be published in PIPE LINE INDUSTRY.

(Chart 1 in a series of 19—4-inch line pipe.)

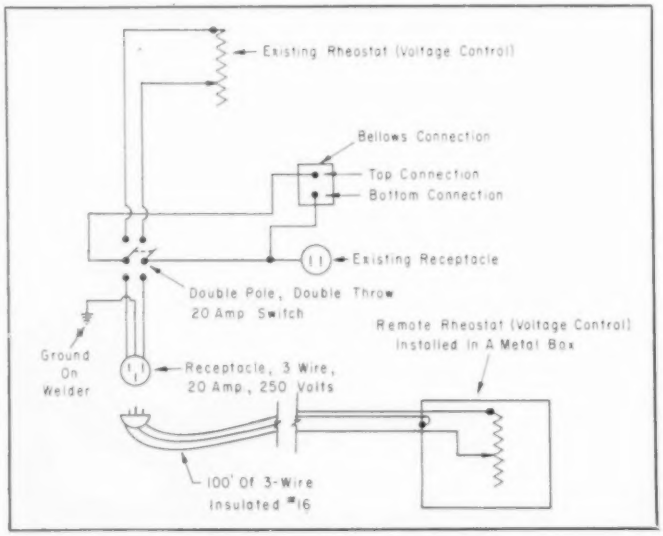
ENGINEERING DESIGN 31



How to do it

PIPE LINE HINTS

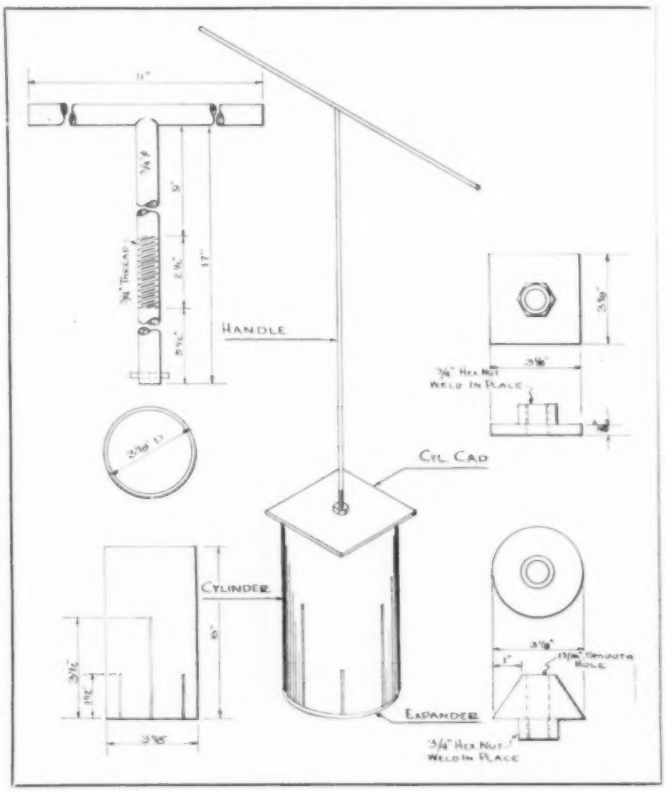
$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texa



Remote Control Unit Regulates Welding Arc

On many a pipe line job the welding machine is located as much as a hundred feet from the actual welding. By installing this remote voltage control a welder can regulate the arc from his working position. The welder merely plugs in a remote control unit and switches from the voltage control on the welding unit to the remote one by means of a double pole, double throw switch mounted on the machine panel.

This allows the welder to have positive control from the machine at the actual job site and reduces excessive trips to the machine for adjustments. The receptacle for the remote control is grounded to the welding machine for added safety.



Tool Eases Valve Pull

The homemade rig shown here eases the tedious task of pulling compressor valves.

Slots are cut in several places on one end of a 6-inch length of 3⅛-inch pipe. The opposite end of the pipe has a 3⅛-inch square plate welded to it. A ¾-inch threaded nut is welded to the plate, and a "T" made from ¾-inch rod is partially threaded in order to fit the nut.

The "T" is run through the nut, plate and pipe. It is then attached to an expander at the far end of the 6-inch length of pipe. As the "T" is turned counter clockwise, the pipe is expanded allowing the valve to be pulled.

Shopmade "Jack" Supports Weight of Valve

In changing the heavy discharge valves on compressors one company uses this special shop made tool as an aid to the maintenance crews. A team of two men can easily remove the necessary bolts with the weight held on the "tool." After the bolt has been removed, the valve can be gently lowered into an accessible position.

Storage Battery Lights Aid Maintenance Repair

Battery powered floodlights can be economically made for use in those remote locations without electrical service. This floodlight is made by mounting an automobile sealed-beam headlight on a shopmade stand. When in use, the light receives power from the battery and generator system of the gasoline engine shown in the background.

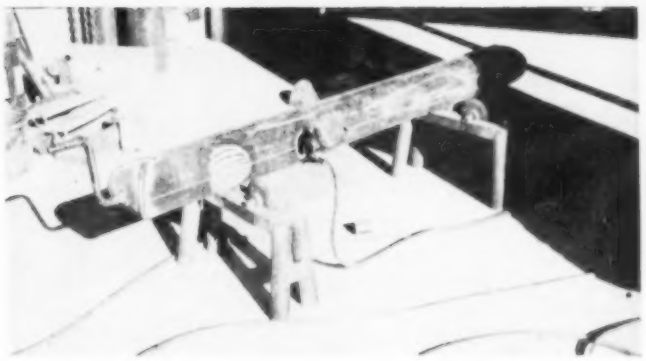
This lighting system makes night emergency repair work easier and safer when needed, it can be used as a semi-permanent installation for "round-the-clock" operating units.

Stencil Identifies Line

This pipe line company identifies its system for the information of anyone concerned. At all valve-setting locations along the line the exposed portion of the pipe line is first painted white, then the name of the company, location of nearest terminal or pump station and telephone number are stenciled on the white background in 3" red letters or numbers.

With the above mentioned identifying features there is no excuse for doubt as to the ownership of the line and location of the operating personnel.

Many trouble calls that might otherwise go unreported are easily channeled to the appropriate operating people with this helpful information.



Crank Handle Eases Fabrication Work

This discarded crank handle comes in handy when fabricating a gas fuel surge tank or in detailed manifold work.

The handle is spot-welded to the capped pipe section, and facilitates smooth, easy rotation of the pipe for layout work. After fabrication has been completed, the handle can be easily removed with a torch for use elsewhere on the job.

Sturdy Ramp Loads Barges

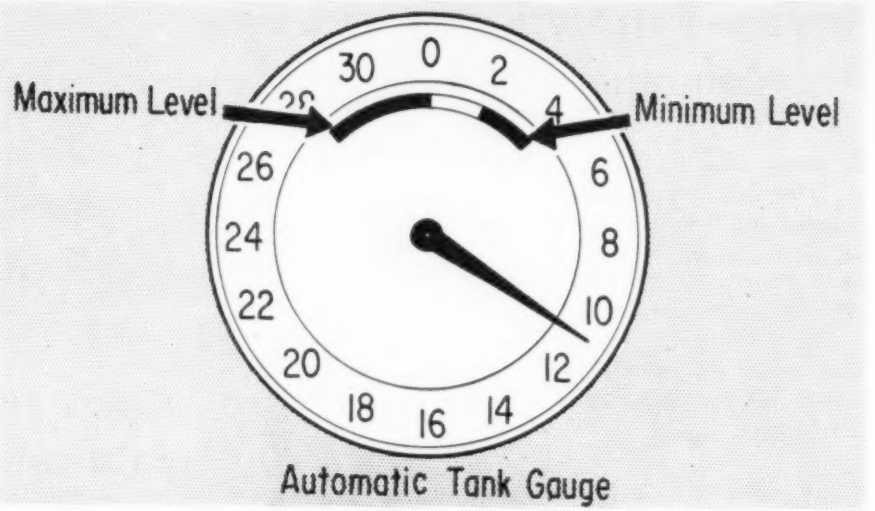
Use this practical, sturdy ramp to replace the makeshift arrangements used to load barges in some remote locations. The general dimensions of this ramp can be adapted to fit the particular location and need, but the over-all construction features are as shown in the photograph.

The size of the members used will vary according to the expected loads and the foundation and bracing will depend on the permanency of the operation. The ramp is hinged in the middle to compensate for tide changes and variations in barge draft as the tow is loaded or unloaded. A small hand winch is mounted on one side to aid in raising or lowering it as the situation demands.

Danger Flags Mark Storage Tank Limits

To familiarize the relief personnel with the working limits of a storage tank, these handy "flags" can be extremely helpful. Strips of red paper can be pasted on the face of the dial to signify when the oil is approaching either the maximum fill level or the lower working level of the tank.

This safeguard could possibly avoid overfilling a tank or prevent accidental shutdown from a main line station due to reduced suction head pressure.



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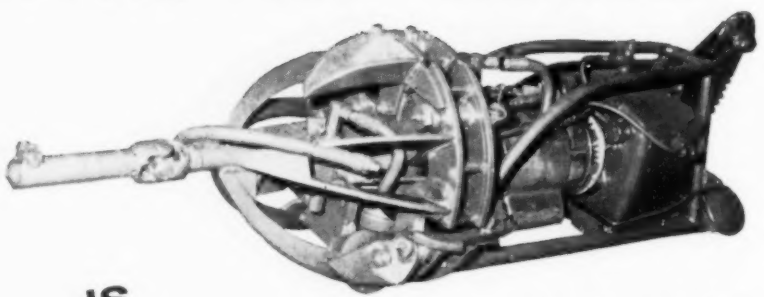

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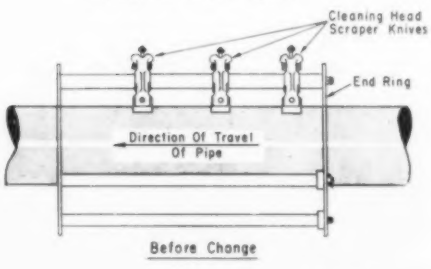
To reduce cleaning machine clogging from paper and pipe line felt off pipe being reconditioned, this simple revision can save time and money.

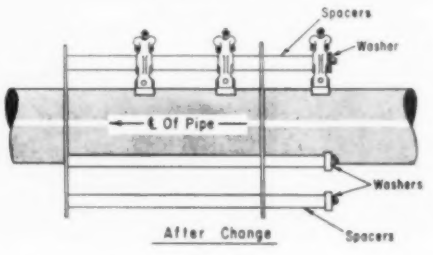
For approximately $10, a new plate can be made from junk material and installed immediately behind the front set of scraper knives. This leaves the front set of knives free to tear paper and felt off the pipe upon removal of the original plate.

This device reduces downtime required for clearing the cleaning machine head and allows more pipe to be cleaned during the man hours involved.

Model "B" Cleaning Machine
Showing Part Of Cleaning Head



Before Change



After Change

"Something From the Irishman"

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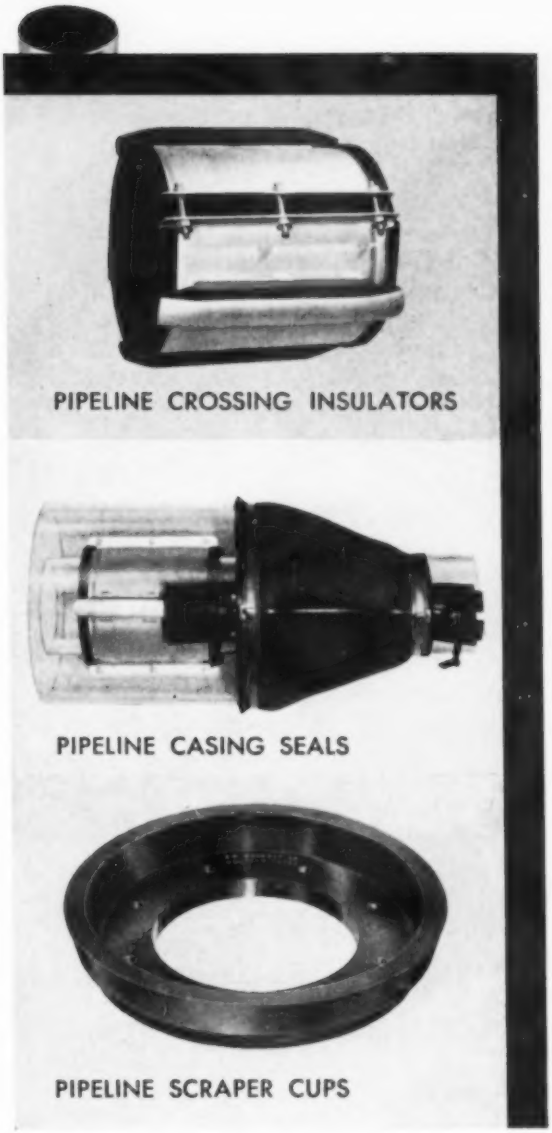
Flange Insulation
Pipeline Crossing Insulators
Pipeline Casing Seals



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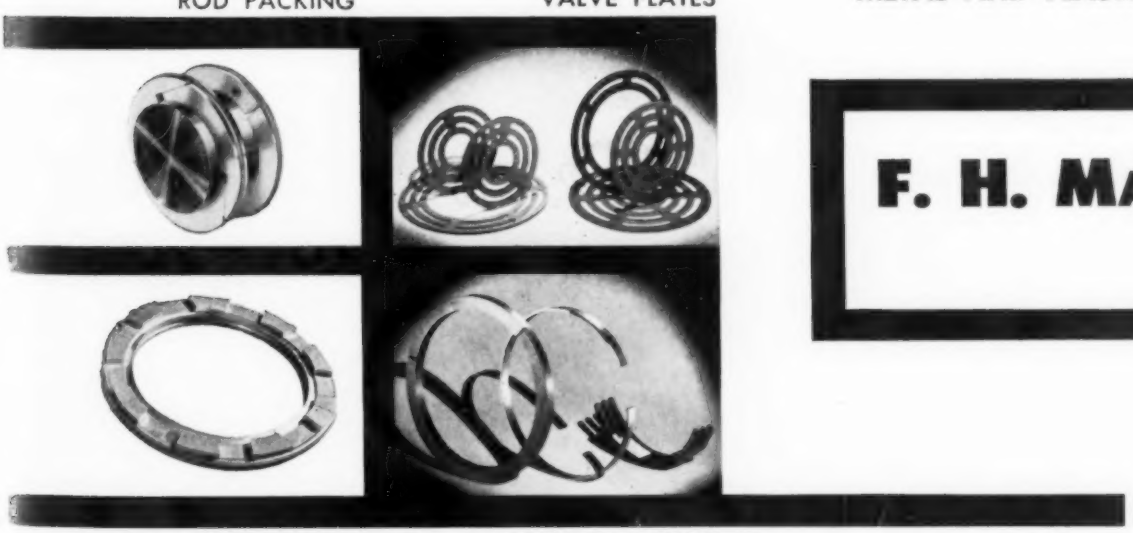

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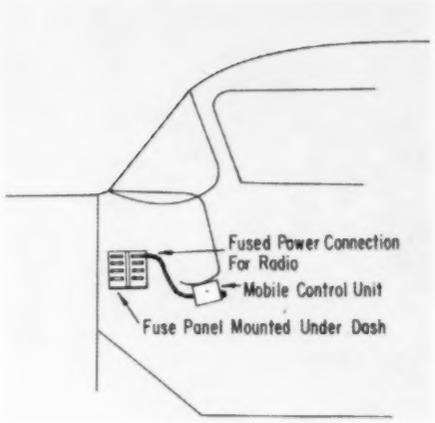
"Precision in Rubber, Metal and Plastics"

Connect Mobile Unit With Fuse Panel

In connecting the power wire on a mobile unit it is often very difficult to reach the necessary location on the ignition switch. In many of the late model cars a fuse panel has been installed under the dash in a more accessible spot. Unless the car is "loaded" with extras there are generally some blank fuse connections left on the panel. By linking to the blank connections on the panel, much time and effort can be saved and the same purpose can be accomplished.



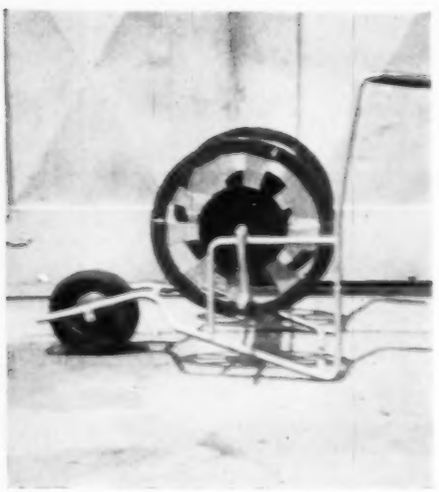
Mobile unit connection.

Store, Transport Hose On Portable Reels

The portable hose reels shown here can be made of scrap pipe, wheels and a used reel. The first one shown is of a wheelbarrow type and can be moved easily or stored when not in use. The reel is turned with the handle as shown in the photograph and is a handy place for storing watering hose.

The second one shown will hold about 200 feet of one-inch hose and is still of a portable nature. The shaft has a pin to engage the handle which is slipped over the end of the shaft when reeling the hose in or out. Handle can be stored under the frame when not in use. The frame shown is made from scrap ¾-inch pipe with 2-inch wide by 6-inch high wheels and a reel 2-feet in width.

Both of these labor saving devices can help insure neatness in station appearance by giving a handy storage place for hose as well as an easy method of transportation.



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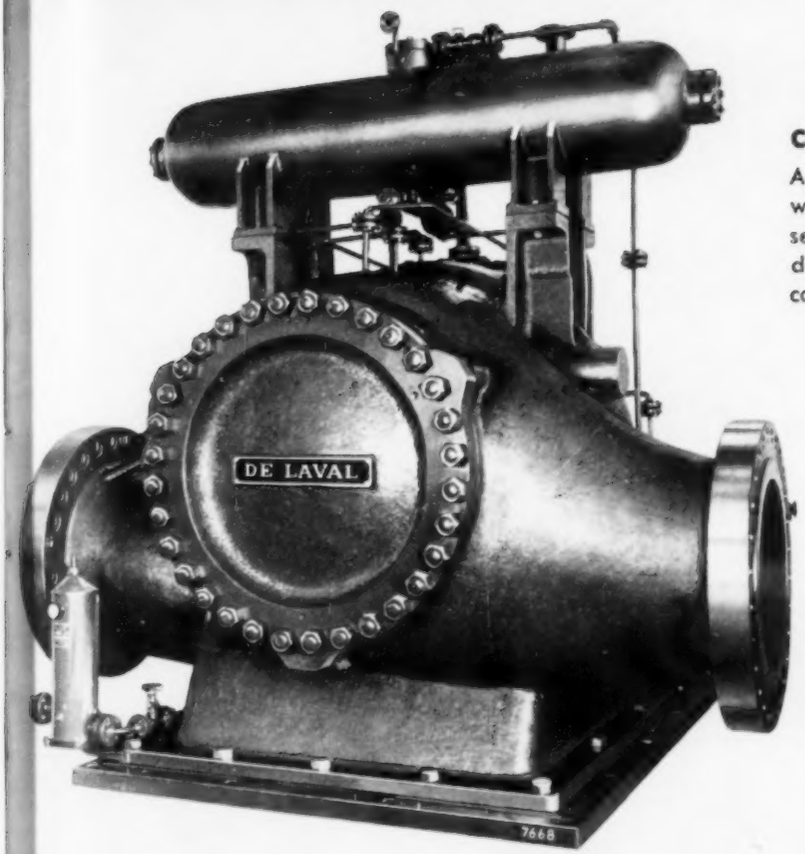
DE LAVAL
CENTRIFUGAL PIPELINE COMPRESSORS

come in two "packages" for easy installation

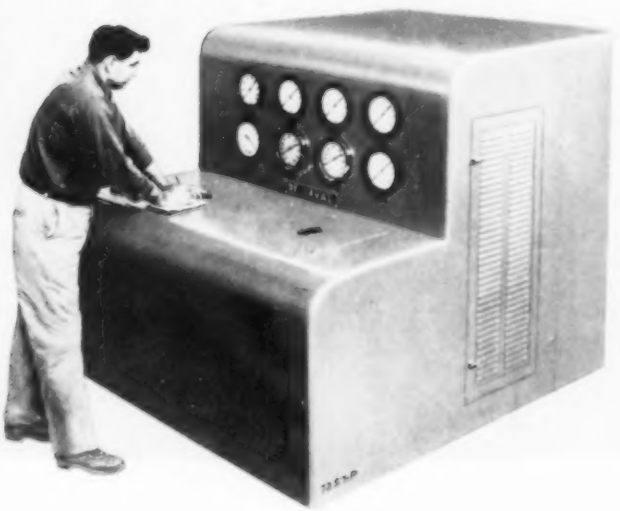


COMPRESSOR

A De Laval compressor with its emergency seal tank mounted directly on the compressor.

CONSOLE

The console contains the filters, motor-driven pumps, coolers, pressure switches, gauges and other accessories. It eliminates complicated piping on the packaged compressor . . . also serves as a protective cover for the equipment it houses.



Bulletin 503 gives data on De Laval centrifugal pipeline compressors. Write for your copy.

Designed in two packages, rugged De Laval centrifugal compressors offer many important engineering features. Among these are • high pressure contact shaft seal which eliminates gas leakage • heavy and rigid construction throughout • high load carrying capacity. The compressor and console arrangement makes De Laval centrifugal compressors easy to install—only simple low-cost foundations are required. De Laval units, totaling more than 280,000 horsepower, are now in operation on major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
884 Nottingham Way, Trenton 2, New Jersey

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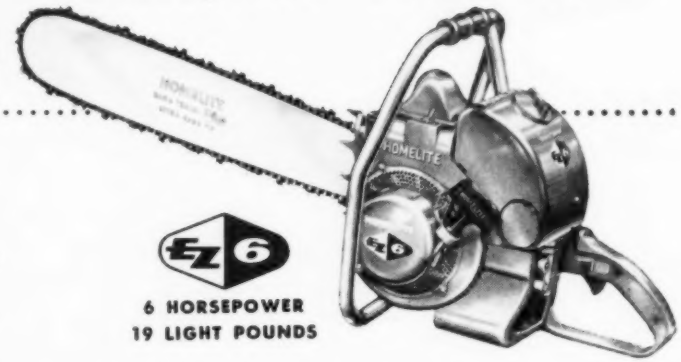
Choose from Two NEW HOMELITE CHAIN SAWS...

the 6-Horsepower "Power Twins"

The Homelite EZ-6
DIRECT DRIVE CHAIN SAW

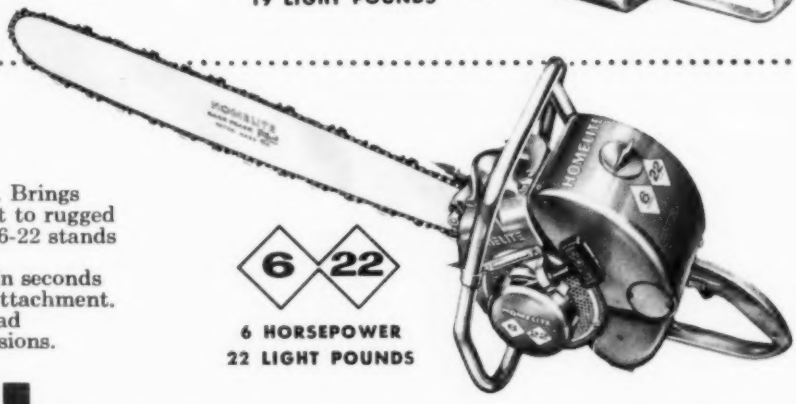
Fastest-cutting direct-drive chain saw made, the 6 horsepower of the EZ-6 makes quick work of trees up to 5 feet in diameter. Famous Floating Power and a light 19 pounds make the EZ-6 easiest of all to handle. Ideal for clearing building sites, repairing storm damage, maintaining rights-of-way.



6 HORSEPOWER
19 LIGHT POUNDS

The Homelite 6-22
GEAR DRIVE CHAIN SAW

Most versatile chain saw you can own, the 6-horsepower, 22-pound 6-22 does everything. Brings down big trees, up to 7 feet in diameter. Built to rugged professional standards, the smooth-operating 6-22 stands up under the grind . . . day in and day out. Money-saving attachments convert the 6-22 in seconds to plunge-cut bow, brush-cutter or clearing attachment. Does any woodcutting job for contractors, road builders, utilities, tree surgeons, park commissions.



6 HORSEPOWER
22 LIGHT POUNDS

WIN A FREE CHAIN SAW EVERY YEAR FOR LIFE... IT'S EASY!

Nothing to buy, nothing to write, no obligation. Just have a free demonstration of the new Homelite Power Twins. You may have three chances to win! GRAND PRIZE: a free Homelite chain saw every year for life, PLUS 25 chain saws given away by Homelite District Offices, PLUS hundreds of chain saws being awarded by Homelite dealers in their own local contests. Register now! Limited to residents of the United States and subject to local state, county and city laws.

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Homelite Builds and Sells More Chain Saws than any Other Company in the World
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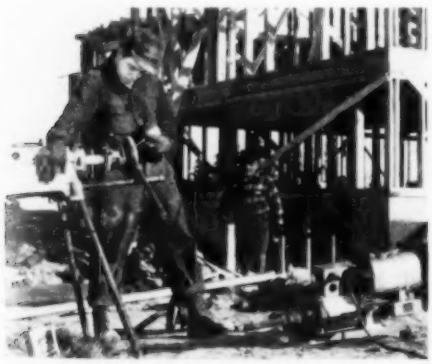
Homelite Now Has Full Line of Carryable Construction Equipment

Self-Priming Centrifugal Pumps . . . Carry these lightweight, dependable pumps anywhere. Non-clogging design . . . 28 foot suction lift . . . capacities up to 15,000 g.p.h. . . . sizes from 1½" to 3". Diaphragm pump also available.

Builder's Hammer . . . Gouge, drill or chisel in any type of material — faster, easier, and at lower cost — with a Bosch (Germany) Builder's Hammer. Automatic rotary impact action for drilling. Either 110 volt AC-DC or high-cycle motor. Powerful, high-cycle rock drill also available. Both tools may be powered by a Homelite carryable generator.



Carryable Gasoline Engine-Driven Generators . . . Lightweight Homelite generators can be carried and used anywhere to provide high-cycle and 115 volt power for your electric vibrators, tools and floodlights. Complete range of sizes up to 5,000 watts . . . all standard voltages.

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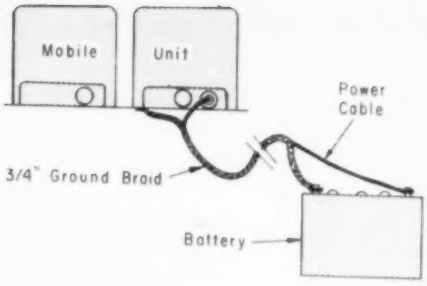
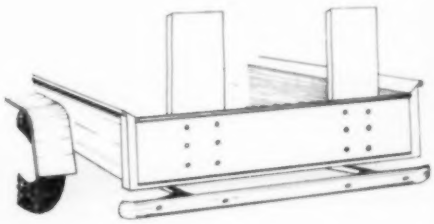


Ground Braid Protects Mobile Unit Cable

When installing power cables used in connecting mobile units in pipe line vehicles, consideration must be given to the problem of protecting the cable from normal abuse.

Protecting the cable from this abuse is generally difficult due to the long run from the radio unit to the battery terminal. Some ¾-inch ground braid can be used to ease this situation. The cable is passed through the ground braid with the braid grounded to the battery and the set at either end.

This installation furnishes a good ground for the set itself while protecting the vital power cable.



Mount Loading Ramp To Move Equipment

This handy loading ramp can be used in conjunction with portable or pick-up mounted equipment that must continually be moved from place to place on the job.

Two 2 x 12's are bolted directly to the tail gate of the truck or trailer. The 2 x 12's can be reinforced with 1-inch angle iron if the load demands, or guide runners are necessary.

This installation facilitates the loading and unloading and assures that the make-shift ramp is not left behind, or lost in the field.

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CATALOG NUMBER 569-P 7

TO REPAIR PIPE LEAKS— QUICKLY, PERMANENTLY

ANY PRESSURE — ANY TEMPERATURE

SKINNER-SEAL EMERGENCY PIPE CLAMP for pinhole or corrosion leaks.

SKINNER-SEAL PIPE LINE CLAMP for long splits and bad corrosion leaks.

In stock—all supply stores

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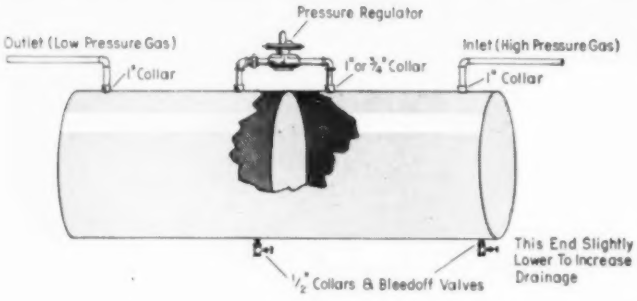
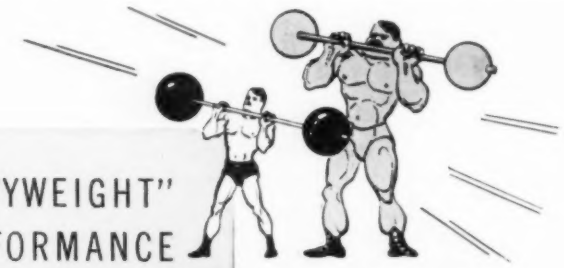
Gas "Log" Helps Prevent Regulator Freeze-Up



This shop-made gas log serves a dual purpose when using wet gas from a field lease.

The compartment shown in the middle divides the high pressure and low pressure side, with the regulator connecting them. The increased cross-section of the compartment over the incoming line reduces the velocity of the gas, allowing a certain percentage of the moisture to fall out. Two ½-inch "bleed-off" valves facilitate the removal of accumulated moisture, thereby reducing the possibility of having the regulator freeze-up during sudden cold snaps.

The volume of gas stored in the "log" acts as a partial surge-dampener during fluctuating operations of the gas engine.



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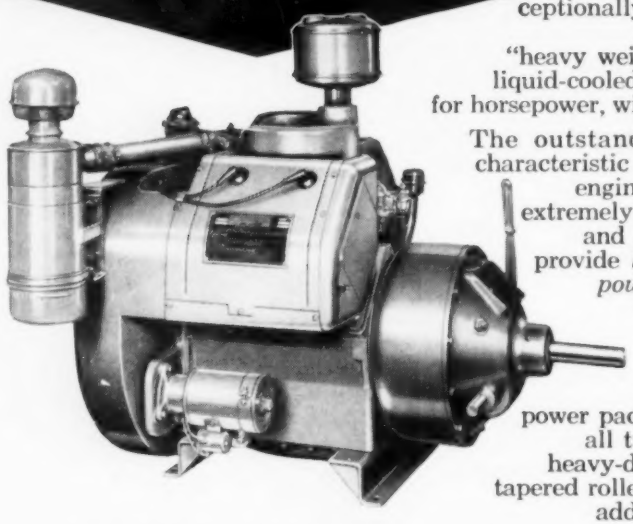
in a light weight, man-size

WISCONSIN *Air-Cooled* **ENGINE**

the NEW
56 H. P.
Model VR4D
4-Cylinder Engine



Model VR4D Open Engine with heavy-duty clutch, rotating screen, electrical equipment and pre-cleaner.

• Climaxing years of engineering development, this great new engine offers manufacturers and users of power equipment all the advantages of AIR-COOLING, at temperatures from low sub-zero to 140° F., in an exceptionally rugged engine that measures up to any "heavy weight" industrial type liquid-cooled engine, horsepower for horsepower, with many *plus values*.

The outstanding High Torque characteristic of the Model VR4D engine, combined with its extremely rugged construction and heavy-duty stamina, provide *load-lugging holding power*, long life and top power performance.

Advanced "V" design provides an extremely compact power package which includes all traditional Wisconsin heavy-duty features such as tapered roller main bearings plus additional new features.

•

This new engine rounds out a complete line, comprising 15 models in 4-cycle single cylinder, 2- and 4-cylinder sizes, from 3 to 56 hp. Write for "Spec" Bulletin S-207.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

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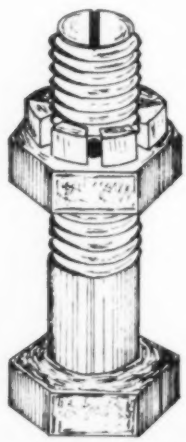


Groove Cut in Bolt Locates Cotter Key

Vibration of various machines often requires locking the nut on a bolt. There are several ways of doing this, one of which is with a slotted castle-nut and cotter key arrangement.

If the bolt is located in an out-of-the-way location, it is often difficult to line up the slots in the castle-nut with the cotter key hole in the bolt.

By cutting a groove across the top of a bolt with a hacksaw or chisel indicating the direction of the hole, much of the difficulty can be eliminated. After the nut has been made up tight, the insertion of the cotter pin can be made quite easily by lining up the slots in the castle-nut with the groove on top of the bolt.

This arrangement can save considerable time when using this type of bolt, if the installation must be made at night, or in "tight" locations, or if the equipment is greasy.

Little Inch Will Reconvert to Petroleum Products Carrier

After lengthy delay, the Federal Power Commission has authorized Texas Eastern Transmission Corporation's reconversion of the Little Inch pipe line from a natural gas carrier to a petroleum products carrier.

The FPC ruling was upheld recently by the United States Circuit Court of Appeals for the District of Columbia which dismissed a barge line's appeal aimed at staying the FPC decision.

The 1168 mile section of the Little Inch scheduled for completion reconversion by September extends from Baytown, near Houston, Texas, to Moundsville, West Va., and will connect with a 14-inch pipe line which the company will build from Seymour, Indiana to Chicago. This will establish the first major petroleum products common carrier pipe line link between the Gulf Coast and Mid-Continent refining areas and the fast growing midwestern market area.

At the same time, the FPC authorized Texas Eastern's construction of substitute natural gas facilities sufficient to handle the gas now being carried through the Little Inch. The reconversion and extension of the Little Inch will cost $35 million facilities to replace the Little Inch gas capacity will cost $61 million.

Substitute gas facilities involve construction of 453 miles of 30-inch pipeline loops and addition of 42,300 compressor horsepower primarily along the company's 30-inch natural gas pipe line between Beaumont, Texas and Uniontown, Pa. Four compressor stations will be built at Gillis and St. Francisville, La., Clinton, Miss., and Booth, Texas. Compressor horsepower at Vidor, Texas and Holbrook, Penn., will be increased.

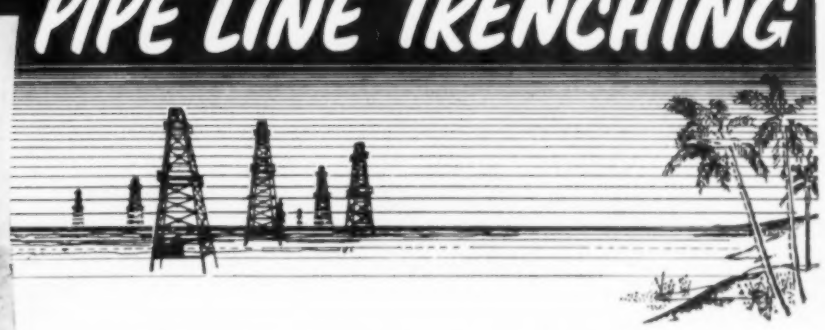
Contracts have been let to four firms for construction of the substitute facilities. They call for 530 miles of 30-inch loop pipe lines and compressor station construction and additions. The pipe line includes the 453 miles authorized in June and an additional 77 miles authorized last October.

The four construction companies are Brown and Root, Inc., H. C. Price Company, Williams Brothers Company and Houston Contracting Company.

PIPE LINE TRENCHING

16/60 Model Trencher digging in hard sand

in the MIDDLE EAST



Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

Three models are available, the 12/21, the 16/60, and the new 14/30 for medium size trenches.

ALLEN TRENCHERS

Illustrated catalogues and technical data on request.

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FPC Reverses Ruling: Agrees to CATCO Gas Price

The Federal Power Commission's recent decision reversed a previous ruling and gave the CATCO group of oil companies authority to charge the price it negotiated for a vast supply of tidelands natural gas. This ruling will allow CATCO to sell the gas to Tennessee Gas Transmission Co.

The price of 21.4 cents per MCF, plus the one-cent Louisiana tax, has been negotiated between CATCO and Tennessee and agreed to by contract.

In May the FPC had ruled that CATCO could not charge more than 17 cents for the same gas — a decision made without the normal cost and expense data to support it. The FPC's reversal of opinion acknowledged the probability that the 17 cent price would result in a cancellation of the contract between CATCO and Tennessee.

The gas supplies involved represent the largest reserve of gas ever to be involved in a single transaction. The contract sells Tennessee almost 7 trillion cubic feet of reserves in the East Cameron, West Cameron and Vermillion areas off the Louisiana coast.

The CATCO group is made up of Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co. and Cities Service Producton Co. Continental is the operating representative for the group.

Marine Gathering Company To Build CATCO Offshore Lines

Marine Gathering Company, construction division of the Commonwealth Oil Company, has been awarded a contract with the CATCO group to build approximately 30 miles of 6, 8 and 12-inch pipe lines in the Gulf of Mexico off Grand Isle, La.

The project will constitute an oil gathering system for the production of the CATCO group in Blocks 46 and 47 of the Grand Isle area, connecting with a short terminal at Grand Isle, about 50 miles due south of New Orleans and in the Mississippi River delta area.

Contracts call for lines to be buried after testing to a minimum of three feet under the Gulf floor with the shore end of the line to be buried at a depth of 10 feet.

Submarine pipe line trenching work on the project will be handled by Collins Construction Company.

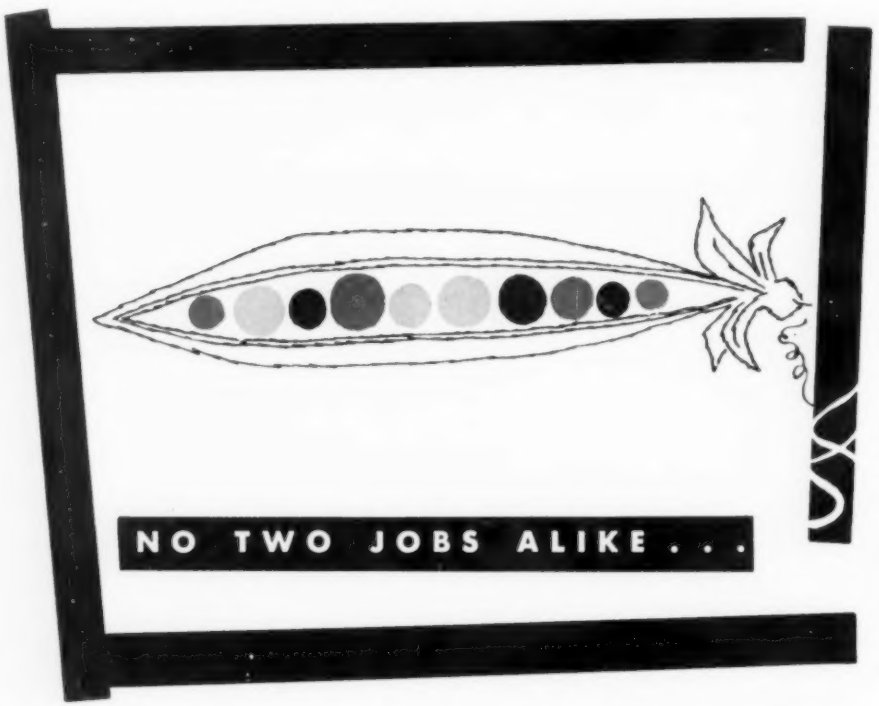
The cost of the project was not revealed. Completion is scheduled near the first of September.

Royal Dutch Oil Plans Rotterdam-Rhineland Link

The Royal Dutch Oil Company is planning a 24-30-inch oil pipeline approximately 155 miles long to link the mouth of the Rhine River with the German Rhineland.

Scheduled to start in the Rotterdam area, the "Rotterdam pipeline," is primarily intended for transport of petroleum to existing refineries and to others in the planning stage or under construction in the Rhineland.

Construction should start at the end of the year.



The successful completion of a Sheehan job — on time and on cost — is the result of careful planning and efficient operation by veterans in the construction of intermediary and connecting lines as well as the longer transmission lines . . . regardless of varying requirements for different jobs.

Sheehan "spreads" assure satisfaction simply through the use of the most modern and efficient methods, and through close attention to detail . . . every mile of the way.

Let Sheehan's experience work for you on your next pipe line project.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

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NATIONAL BANK OF TULSA BUILDING

TULSA, OKLAHOMA

1,075 Controlled Miles

From Worland, Wyoming, to Wood River, Illinois — 1,075 miles, it is ***E-I-M*** all the way.

Some unique engineering steps were pioneered on the Platte Pipe Line, which covers five states and crosses two of the largest rivers in the United States, the Missouri and the Mississippi. It is one of the largest and longest crude oil carriers ever constructed, with 14 pumping stations along the line, and E-I-M Valve Controls are being used exclusively from end to end. There are more than 200 E-I-M Valve Controls of various types on this 16" and 20" line.

All over the world, ***E-I-M Valve Controls*** are the guardians of the oil and gas industry's life lines, of which Platte Pipe Line is a mighty artery.

Progressive Pipe Liners Specify E-I-M VALVE CONTROLS

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Valve Controls • Speed Reducers • Cooling Tower Drives • Control Valves

For more data on advertised products, use Readers' Service Cards, last page.

Four Corners Pipe Line Contracts Let To Texas and Missouri Constructors

Two Texas firms and a Missouri company have been awarded contracts for construction of more than half of the new Four Corners Pipe Line.

A. P. Vaughn Construction Company of Fort Worth, the R. H. Fulton Construction Company of Lubbock and the Potashnick Construction Company of Cape Girardeau, Mo., will build 485 miles of the approximately 750-mile-long crude oil pipe line system originating near the common corners of New Mexico, Colorado, Utah and Arizona and terminates at refineries near Los Angeles.

For purposes of contract awards, the line's route has been divided into nine sections. A. P. Vaughn and Potashnick will jointly build 170 miles of 16-inch line from Aneth field in southern Utah to Cameron, Arizona, with work now underway.

R. H. Fulton company will build 98 miles of 16-inch line from Cameron to Seligman, Arizona and 2 7 miles of 16-inch from the Colorado River to Olive, Calif. Construction on the segment from Cameron to Seligman is underway. Work on the other sections has been delayed until October to avoid work in the desert areas during the hot summer months.

Contracts for the remaining four sections of the system will be let in the near future, as will the contract for construction of one major river crossing spanning the Colorado River.

Survey work is complete and 16-inch pipe is arriving on schedule. The main line will include 635 miles of 16-inch pipe from Aneth field to Los Angeles. In addition, there will be 86 miles of 12-inch from New Mexico's Bisti field to Red Mesa station about 35 miles southeast of Bluff, Utah, and about 3 miles of 6, 8, and 10-inch feeder lines from other fields in New Mexico and Utah.

Humble Plans Expansion Of Lines and Processing Plant

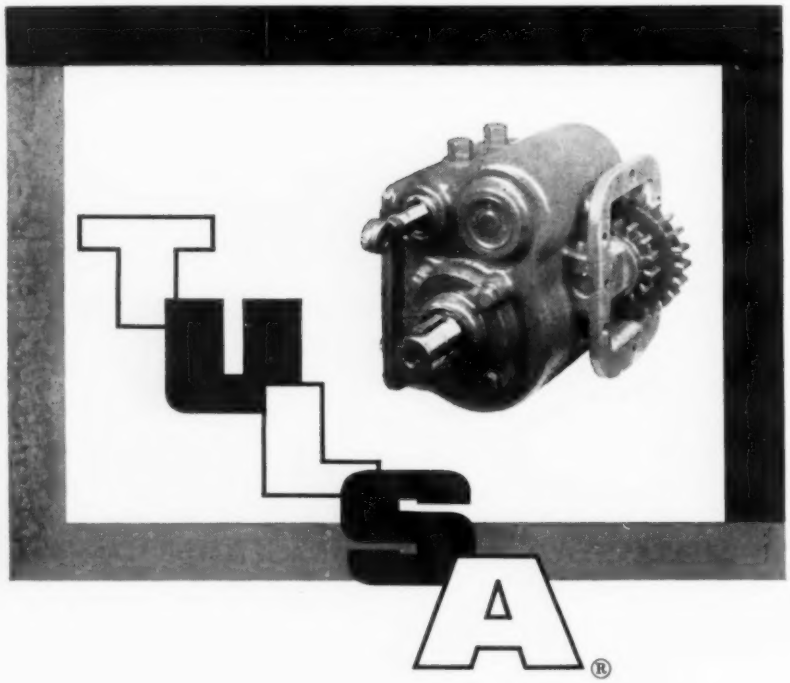
Humble Oil & Refining Company recently announced plans for a major expansion of its gas operations in South Texas to include an extensive pipe line gathering system, a transmission line and what has been called the world's largest cycling plant.

Two hundred miles of main gathering system lines of varying sizes and 250 miles of 26 or 30-inch main gas-transmission line would deliver gas produced by the company from numerous Southwest Texas fields including wells on the King Ranch to Humble's industrial customers in the Houston-Baytown-Beaumont area.

Tentative plans for the gas processing and cycling plant call for a capacity of about 750 million cubic feet. It will be designed to recover approximately 25,000 barrels a day of regular gasoline liquid products consisting primarily of propane, butanes and a mixture of natural gasoline and heavier hydrocarbons.

The plant site has not been determined but the Kingsville, Bishop or Alice areas of South Texas are considered among the most likely locations.

Cost of the entire project has been estimated at about $75 million.



POWER TAKE-OFF FAVORITE

Yes, a Tulsa Power Take-Off is a national favorite . . . because it offers unequaled quality in a durable, powerful, compact power take-off which runs so quietly you won't know it's working . . . except by the efficiency with which it transfers your engine power to the job. In a variety of sizes from single speed, medium duty to multiple speed heavy duty feature heat-treated cast or die-cast aluminum housings; anti-friction bearings throughout; shaved, hardened and ground gears . . . all at extremely low prices . . . and available to you through nationwide distribution and service. See your nearest Tulsa distributor for complete details and prices.

Tulsa Winch
TULSA, OKLAHOMA DIVISION OF WICKWIRE

Transco Starts Construction On Purchase Laterals, Loops

Transcontinental Gas Pipe Line Corporation has begun construction on a new phase of an over-all project to bring more natural gas to the New York City-New Jersey-Philadelphia metropolitan area.

The Federal Power Commission recently gave temporary authorization to significant portions of a $54 million expansion project.

The temporary certificate includes 247 miles of new purchase laterals, mostly 24-inch and 16-inch pipe, to reach large new reserves committed to Transco in an area south of San Antonio, Texas.

The FPC authorization also includes 57 miles of 36-inch and 30-inch mainline "loops" in Louisiana, Mississippi, Alabama, Georgia and South Carolina; three compressor stations in North Carolina and Virginia; additional compression horsepower at existing stations in Texas, Louisiana and Pennsylvania; and eight new dehydration installations in connection with gas reserves in Texas.

Transco's 28.5-mile line to connect new gas reserves in the Gulf off the Louisiana coast to the company's main line is scheduled for completion the middle of this month.

Texas Eastern, Penn-Jersey Add Station Facilities, Lines

Texas Eastern Transmission Corp. and its subsidiary Texas Eastern Penn-Jersey Transmission Corp. recently were given authority from the Federal Power Commission for expansion projects that will cost approximately $30 million.

The facilities authorized will add 67,610 horsepower of compression facilities and 137 miles of line. Included in the facilities approved is a 10,250 horsepower compressor station near Mont Belvieu, in Chambers county, Texas. Horsepower will be increased at three stations in Louisiana, Mississippi and New Jersey.

Ninety-six miles of additional 30-inch pipe line loops along the company's existing line between Kosciusko, Miss. and Uniontown, Penn., and approximately 40 miles of new lateral supply lines were included in the FPC directive.

Construction has begun and should be completed by September.

Trans-Canada Clears Granite

After hills of rock have been blasted by high explosives, the huge slabs of granite are cleared from the right-of-way in Eastern Manitoba as construction progresses on the Trans-Canada Pipe Line's natural gas line from Alberta to Eastern Canada. Further blasting will be required for the ditch which will be four and one half feet deep.

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Tennessee Gas Lets Five Contracts For Gas Loops and River Crossing

Tennessee Gas Transmission Company has let contracts for five projects totaling 68 miles of gas loop lines and one triple 24-inch crossing on the Mississippi River. The projects are part of a larger loop expansion program totaling 332 miles.

Harford Brothers Pipe Line Contractors will build a 10-mile, 24-inch Pittsburgh, Pa. spur loop. Bechtel Corporation has been given the contract for 24 miles of 30-inch line in northeast Kentucky, and Oklahoma Pipe Line Constructors will lay 34 miles of 30-inch pipe in south central Kentucky.

The triple underwater crossing of the Mississippi River near Greenville, Miss. will be constructed by Pentzien, Inc. with the Collins Construction Co. as sub-contractor.

Tennessee's overall pipe line construction program includes 1085 miles of line, compressor stations and additions. The estimated cost is $167 million.

Lake Anahuac Crossing

United Gas Pipe Line Company's new eight-inch pipeline bringing natural gas from the Trinity River delta area of Chambers County on the Texas Gulf coast, encountered an unusual construction problem. A pipe-laying barge was hauled overland in five sections and then reassembled on the lake shore since Lake Anahuac is separated from the Trinity River and Trinity Bay by levees. The barge, with the assistance of sideboom tractors on shore, was used to pull the pipeline across the lake. A shallow-water dredge prepared a three-foot deep trench into which the line was lowered. A dragline mounted on the barge will backfill the trench after pressure testing.

Paraguay-Bolivia Governments Open Bids on Crude Lines

Public bids are being accepted for the construction of a projected pipeline from the southeastern Bolivia oil fields to the Paraguay River.

The Ministry of Finance, Asuncion, Paraguay has announced that the 350-mile crude line will run across the Chaco from the Bolivian border to Asuncion.

Also under proposed construction is a 3000 barrel per day refinery which will take between 24 and 28 months for completion at an estimated cost of $14 million.

The 6⅝-inch pipeline will have a 5000 bpd capacity which will meet all of Paraguay's domestic demand and leave a surplus for export. The total length of the line eventually will be more than 450 miles, starting at Villa Montes, Bolivia, crossing the Chaco to the Paraguay River, then running south to Asuncion, Paraguay's capital, a descent of almost 3000 feet.

The crude oil line is one of two projected Paraguayan outlets for the Bolivian government oil company's production. An agreement covering construction of such lines was signed early this year by the two governments.

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CARROLL V. KROEGER, *distribution engineer, Washington Natural Gas Company, Seattle, Wash.*

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PROPOSED PIPE LINE CONSTRUCTION

U. S. and International

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Carolina Pipe Line Co., 177 miles, 10, 8 and 6 inch, gas, between Blacksburg and Camden, S. C., contract let to Panama-Williams Corp.

Cities Service Gas Co., Oklahoma City, 116 miles, gas, facilities in Kansas and Oklahoma and pipe lines in Kansas, $11.4 million, authorized.

Cities Service Pipe Line Co., Bartlesville, 168 miles, 6-inch, products, from East Chicago, Ind., to Lowell, Mich, contract let to Somerville Construction Co.

Coastal Transmission Corp., Houston, 565 miles, 20-26 inch, gas, from McAllen, Texas to Louisiana connection of Houston, Texas Gas and Oil plus 272 miles of laterals, $68 million, authorized.

Colorado Interstate Gas Co., Colorado Springs, 734 miles, 22-34 inch, gas, from Texas & Okla. Panhandle to Kit Carson, Colo., to Beatrice, Neb., $87 million, before FPC.

Deep Rock Gas Co., Oklahoma City, 120 miles, 6-inch, LPG, from Tioga, N. C., to Canadian border, planned.

East Ohio Gas Co., 113 miles, 24 and 30 inch, gas, Brush Station, south of Cleveland to Texas Eastern's Station No. 19 near Summerfield, Ohio, contract let to Sharman, Allen, Gay and Taylor.

El Paso Natural Gas Co., El Paso 439 miles, 6-34 inch, gas, facilities in Texas, New Mexico and Arizona to deliver gas to Southern Calif. Gas Co., Southern Counties Gas Co., and Pacific Gas & Electric Co., $107 million, before FPC.

El Paso Natural Gas Products Co., 240 miles, 8 inch, products, from Midkiff natural gasoline plant in Permian Basin to El Paso, planned.

Florida Pipeline & Storage Company, 67 miles, products, from Port Everglades to Homestead Air Base and storage facilities, contract let to Fish Service Corporation.

Four Corners Pipe Line Co., Houston, 600 miles, 16 inch, crude, from Four Corners area to Los Angeles plus 150 miles of feeder lines, $50 million, contracts let on 485 miles to A. P. Vaughn Construction Co., R. H. Fulton Construction Co. and Potashnick Construction Co.

Great Lakes Pipe Line Co., Kansas City, Mo., 84 miles, 8 inch, products, extension of system to Eau Claire, Wis., planned.

68 miles, 12 inch, products, from intersection of system with Badger Pipe Line into Chicago, 49.5 miles, let to M-R Company.

140 miles, 8 inch, products, from company's terminal at Minneapolis to terminals at Superior, Wis., planned.

34 miles, 12 inch, from Tulsa to Barnsdall, Okla., planned.

Gulf Interstate Gas Co., Houston, additional compressor facilities in Kentucky, Tennessee, Mississippi, and Louisiana, and 10 miles of gathering lines from Erath field, gas, $24.5 million, temporary authorization.

Houston Texas Gas & Oil Corp., gas, Baton Rouge, La., to Miami, $95 million, authorized.

Humble Oil & Refining Co., 200 miles, main gathering system line of varying sizes, 250 miles, 26 or 30 inch main carrier, gas, from southwest Texas to Houston, plus gas processing and cycling plant near Corpus Christi, $75 million, planned.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, before FPC.

Laurel Pipe Line Co., Philadelphia, 440 miles, 14-24 inch, products, from Philadelphia to Pittsburgh to Cleveland, $50 million, planned.

Magna Pipeline Co., 40 miles, gas, underwater line from Anacortes, Wash., to Victoria, B. C., $6 million, planned.

Michigan-Wisconsin Pipe Line Co., Detroit, 472 miles, 4, 24-inch, gas, main line loops and extensions in Wisconsin, Illinois, $17.6 million, before FPC, temporary authorization for a part.

Midwestern Gas Transmission Co., Houston, 1112 miles, gas, from Emerson, Manitoba, to Nashville, Tenn., $103 million, before FPC.

Mountain Fuel Supply Co., Salt Lake City, 38 miles, 20 inch, gas, parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo., $3 million, authorized.

Muskegon Pipe Line Corp., Detroit, 165 miles, 10 inch, crude, from Griffith, Ind., to Muskegon, Mich., planned.

Natural Gas Pipe Line Co. of America, Chicago, 350 miles, 20, 26 inch, gas, from Wise County, Texas to Fritch, Texas, $28.5 million, 80 miles of 20-inch, let to Eastern Pipeline Contractors and R. H. Fulton Co.

25 miles, gas, from Quinduno field in Roberts County, Texas, $3.2 million, authorized.

416 miles, 36 inch, gas, loops at various points along existing line, $76.2 million, before FPC.

337 miles, 30 inch, gas, loop line between company's terminus in Texas and Beatrice, Neb., $62.7 million, before FPC.

59 miles, 36 inch, gas, Beatrice to Joliet, Ill., before FPC.

North Carolina Natural Gas Corp., 630 miles, 2-16 inch, from Tranco's system near Mooresville across North Carolina, planned.

Northern Natural Gas Co., Omaha, 167 miles, 24 inch, gas, from Farmington, Minn. to Duluth, Minn., and Superior, Wis., $12 million, before FPC.

42 miles, 10 inch, gas, from Rochester, Minn. to Winona and Goodview, Minn., $963,000, before FPC.

365 miles, gas, new facilities in Minn., Iowa, S. D., Neb., Wis., plus 1090 miles of branch line and station facilities, $65.7 million, before FPC.

Northwest Pipeline Corp., Salt Lake City, 350 miles, 6-10 inch, crude and products, Four Corners area to Salt Lake City, $15 million, planned.

Ohio Fuel Gas Co., Columbus, 55 miles, 20, 24 inch, gas, line in Jackson and Gallia counties, compressor facilities at Crawford compressor station, Fairfield County, and pipe line from Crawford station to Licking County Ohio, contract let to O. R. Burden Construction.

Ohio Oil Company, Findlay, Ohio, 200 miles, products, from Wood River, Ill. to Chicago, planned.

Oklahoma Natural Gas Co., Tulsa, 16 miles, 8 inch, gas, to connect gas supplies in Gotebo field, Okla. to Clinton system in western Okla., $350,000, planned.

Pacific Gas & Electric Co., San Francisco, 223 miles, 34 inch, gas, various loops between Topock, Ariz., or Needles, Calif. and Milpitas, Calif., $20 million, 85 miles, let, last 138 miles let to Engineers Limited Pipeline Co.

200 miles, 12 inch, gas, from northern Calif. gas fields to Humboldt County, Calif., $9.5 million, planned.

Pacific Northwest Pipe Line Corp., Salt Lake City, 1000 miles, gas, gathering system in San Juan Basin and sales laterals in Washington plus compressor facilities, $30 million, planned.

Pennsylvania Gas Co., Warren, Penn., 38 miles, 8, 10 inch, gas, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y., $2.6 million, authorized.

Permian Basin Pipeline Co., Omaha, 83 miles, 16 inch, gas, facilities near Spraberry compressor station, Midland County, Texas to tie in with Pioneer gathering system, Schleicher County,

Texas, $5 million, temporary authorization.

Piedmont Gas Co., Hickory, N. C., 78 miles, 2-8 inch, gas, from connection with Transcontinental Gas Pipe Line to serve customers in North Carolina, $2.6 million, before FPC.

Pioneer Natural Gas Co., 70 miles, 12 and 16 inch plus one compressor station, Sutton, Val Verde and Schleicher counties, Texas, $9½ million, contract let.

Salt Lake Pipe Line Co., Salt Lake City, 100 miles, 10 inch, crude, plus additional pumping facilities on Rangely to Salt Lake City line, contract let to Engineers Limited Pipe Line Co.

80 miles, 8 inch, products, new line from Boise, Idaho, to Pasco, Wash., plus additional pumping facilities on Salt Lake City to Spokane line, contract let to Hallmac Construction Co.

Skelly Oil Co., 38 miles, 8 inch, crude, gathering system extension from Nichols field to southern Kiowa County, Kansas, planned.

Southern Kansas Pipe Line Co., Inc., 200 miles, 6-10 inch, crude, southwestern Kansas to Arkansas City, Kansas, planned.

Southern Natural Gas Co., Birmingham, 60 miles, gas, to connect transmission system to reserves in Plaquemines, St. Bernard and Jefferson parishes, La., and waters adjoining, plus compressor, meter and regulating facilities, $8 million, before FPC.

52 miles, gas, various locations in Georgia and Louisiana, $2.2 million, authorized.

Tennessee Gas Transmission Co., Houston, 633 miles, 30 and 24 inch, gas, from Louisiana delta to Portland, Tenn. and Coudersport, Pa. to Hamburg, N. Y., before FPC.

120 miles, 12, 20 and 26 inch, gas, Kinder, La. to offshore fields, authorized.

332 miles loop lines in Tennessee, Kentucky, West Virginia, Ohio, Pennsylvania and Mississippi, 68 miles authorized and contracts let to Harford Brothers Pipe Line Contractors, Bechtel Corporation, Oklahoma Pipe Line Constructors, Pentzien, Inc. and Collins Construction Co., sub-contractor, and 264 miles, before FPC.

Compressor stations in Mississippi, Tennessee, New York, Pennsylvania and additions in Tennessee, Kentucky, Ohio and Pennsylvania, before FPC; $167 million total.

Texas Eastern Transmission Corp., 530 miles, 30 inch loop lines, three compressor stations plus additions to two others, work done along the company's 30-inch trunk line between Beaumont, Texas, and Uniontown, Penn., contracts let to Brown and Root, H. C. Price, Williams Brothers and Houston Contracting Company.

Texas-New Mexico Pipe Line Co., Houston, 515 miles, 16 inch, crude, extension from Jal, N. M. pump station to Four Corners, $6.4 million, planned.

Transcontinental Gas Pipeline Corp., Houston, 317 miles, gas, loop lines and gathering laterals in Texas and Louisiana and compressor facilities in Louisiana, Mississippi, Alabama, Georgia, North Carolina, Pennsylvania and Virginia, $53.7 million, before FPC, temporary authorization for a major part.

Trust Pipe Line Co., Big Spring, Texas, 128 miles, 6 inch, products, from Abilene to Wichita Falls, Texas, $1.5 million, planned.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., considered.

United Gas Pipe Line Co., Shreveport, 40 miles, 8 inch, gas, from Baldwin County, Ala. to Container Corp. of America plant, Brewton, Ala., $1.2 million, authorized.

United Natural Gas Co., Oil City, Penn., 50 miles, 12 inch, gas, from Elk County to Jefferson County, Penn., planned.

Washington Gas Light Co., Washington, D. C., 28 miles, 20, 24 inch, gas, from metering station of Atlantic Seaboard Corp. to Washington to connect with line leading to District of Columbia facilities, $3.4 million, authorized.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., Bella Coola, B. C., considered.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Andes Pipeline Corp., 500 miles, 12 inch, gas, from Villamontes, Bolivia, to Antofagasta, Chile, $30 million, planned.

Bolivian Gulf Oil Co., 201 miles, 8-10 inch, crude, from Sicasica, Bolivia, to Arica, Chile, $10.5 million, planned.

British Petroleum Company, London, 16-inch, crude, from Popton Point, South Wales to Llandarcy refinery, $14 million, considered.

62 miles, crude, from Milford Haven port to Swansea Refinery plus storage tanks and deep water jetty, $18 million.

Canada Southern Petroleums, Ltd., Calgary, 400 miles, crude, from Peace River region of northeast British Columbia to Bella-Coola, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Corp., Caracas, Ven., 94 miles, 28 inch, crude, from Temblador to Caripito, Venezuela, $5.6 million, planned.

Empresa Nacionales de Petroleo, Chile, 75 miles, 10 inch, products, from government refinery at Concon to Santiago, planned.

Gaz de France, 550 miles, 12-24 inch, gas, main line from Lacq field to Paris plus 450 miles of branch lines to Lyons, Nantes and Chateaurous, planned.

Iraq Government, 150 miles, gas, from Kirkuk field to Baghdad, considered.

Iraq Joint Venture Pipe Line, 1200 miles, 38-40 inch, crude, from head of Persian Gulf through Iraq to Turkish coast of Mediterranean, $840 million, planned.

National Iranian Petroleum Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

Paraguay and Bolivia Governments, 450 miles, 6⅝ inch, crude, from Villa Montes, Bolivia, across the Chaco, to the Paraguay River, later to Asuncion, $14 million, planned.

Petroargentina, Bahia Blanca, Argentina, 370 miles, 16 inch, crude, from Neuguen to Bahia Blanca, Argentina, $4[illegible] million, planned.

Petroleos Mexicanos, 150 miles, 14 inch, gas, from J. Colomo field to Minatitlan, $5 million, planned.

80 miles, 8 inch, products, from Guaymas to Los Mochis, $1 million, planned.

150 miles, 22-inch, gas, from Monterrey to Reynosa to tie into Texas Eastern system, planned.

Royal Dutch Oil Co., 155 miles, 24-30 inch, from German Rhineland to mouth of Rhine River, planned.

Royalite Oil Co., Calgary, 350 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, planned.

Saharian Pipe Line Co. (subsidiary of Cie. Francaise des Petroles, Algerie) 100 miles, 6 to 10 inch, from Hassi Messaoud field to Touggourt, Algeria, planned.

Saskatchewan Power Corp., Regina, Sask., 80 miles, gas, Hatton gas field to Success, Sask., planned.

Shell B. P. Petroleum Development, 10 inch, crude, from Oloibiri, Nigeria to Port Harcourt, contract let to Taylor Woodrow.

Stanmount Pipe Line Co., 140 miles, 10 inch, crude, Cayiga and Beaver Lake fields, N. D., to connect with Interprovincial Pipe Line, planned.

Sturgeon Pipe Line Co., 100 miles, 12-inch, Sturgeon Lake field to Trans-Mountain system, $6.5 million, planned.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

Trans-Canada Pipe Line, Ltd., Calgary, Alta., 2250 miles 36 inch, gas, Alberta to eastern Canada, $378 million; contracts let for 10 spreads.

Trans-Europe Pipe Line, 500 miles, 30 inch, crude, from Mediterranean to northern Europe, considered.

Union Gas Co. of Canada, 142 miles, 26 inch, gas, Dawn storage area near Sarnia to Hamilton, Ont., plus branch lines, contract let to Canadian Bechtel Co., Ltd.

Westcoast Transmission Company, Ltd., Calgary, 270 miles, 8-26 inch, gas, various locations in Peace River region, contracts let for 155 miles.

174 miles, 30-inch, gas, Savanna Creek gas field, Alberta, to British Columbian border, planned.

Producers Pipelines, Ltd., Regina, 20 miles, 12 inch, crude, Alida to Carnduff-Glen Ewen area of Saskatchewan plus 34 miles of gathering line, planned.

Winnipeg and Central Gas Co., Winnipeg, Mant., 450 miles, 4-8 inch, LPG, from Tioga, N. D. to Winnipeg, Canada, $20 million, planned.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 1056 miles, 24-inch, gas, Campo Duran to Buenos Aires, Argentina, $76 million, planned.

621 miles, crude, Mendoza to San Lorenzo, Argentina, $19 million, planned.

Pipe Line Men

IN THE NEWS

W. M. Elmer has been elected president of **Texas Gas Transmission Corporation** replacing the late **W. T. Stevenson.** Elmer has been executive or senior vice president and a director of the company since 1955, a vice president since 1950 and has served as president and a director of the Texas Gas Exploration Corporation since 1953.

W. M. Elmer

He joined Texas Gas in 1947 and was elected comptroller in 1948. He was made executive vice president in April, 1957. Prior to the formation of Texas Gas, Elmer was employed as comptroller of Memphis Natural Gas Company, one of the predecessors of Texas Gas.

•

Arkansas Louisiana Gas Company has recently elevated three executives to newly-created vice-presidencies. The men include **E. N. Henderson,** chief engineer since 1954; **B. E. Harrell,** manager of gas supply and sales and **D. W. Weir,** assistant to the president.

Election of the new officers followed the annual meeting of stockholders which also re-elected 11 members of the board of directors. The new board re-elected all present officers and added the three new officers.

•

Harold S. Bell has recently opened offices as a consulting engineer in Newark, N. J. Formerly with the Frederick Snare Corporation, Bell has had wide experience in the petroleum field. As a consulting engineer, he will give particular attention to tankships, shore installations, off loading and loading of vessels and bulk terminals. Bell is the author of "American Petroleum Refining" which is now in revision for a fourth edition and "Oil Shales and Shale Oils."

•

Edel F. Blanks has been elected president of the **Olin Gas Transmission Corporation.** He succeeds **Harold F. Moses,** recently named to the newly created post of board chairman. Blanks has been with the company for 31 years and has been vice president and a member of the board since 1948. Olin Gas Transmission is a subsidiary of **Olin Oil & Gas Corporation** which re-elected its directorate and corporate staff. These include **John Hanes** as board chairman, Moses as president and Blanks as executive vice president.

•

G. P. Brockmann was appointed chief engineer and **W. E. Fryer** as project engineer for **Guy T. Martin & Company, Inc.** Brockmann was formerly with the Richfield Oil Corporation as general engineer, production department, Southern division. Fryer was a project engineer for Richfield Oil Corporation in the Los Angeles area.

•

Sinclair Oil & Gas Company announced the promotion of **E. H. Counts** to staff general superintendent of the Gas and Gas Products department. He fills the post vacated by the recent death of **J. L. Gallagher.** Counts was formerly superintendent of operations in the Gas and Gas Products department.

•

Russell H. Clark of Phillips Petroleum Company's Natural Gasoline department recently received the recognition award of the **Natural Gasoline Association of America.** The award was presented to Clark for recognition of valuable service to the natural gasoline industry in the field of gas testing and gas settlements.

•

D. G. Sisterson has been elected a director of **Texas Gas Transmission Corporation.** Sisterson is principal partner in the firm of D. G. Sisterson & Co., certified public accountants in Pittsburgh and New York. He is a director and member of the executive committee of Morewood Realty Corporation and Metwood Investigating Corporation of New York.

D. G. Sisterson

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Magnolia Pipe Line Company officials in Dallas announced the appointment of **Grafton L. Jeter** to chief dispatcher. He joined Magnolia Pipe Line in 1931 as operator-gager at the Simsboro pump station near Teague, Texas. He was transferred to Dallas in 1936 as dispatcher and in 1951 was promoted to assistant chief dispatcher.

•

Robert O. Parker has been appointed assistant controller of **Trunkline Gas Company.** He has been supervisor of the Accounting department since 1954.

•

J. W. Mackey has assumed the duties of operations and maintenance superintendent, Pipe Line department, **British American Oil Company Ltd.** Located in Edmonton, Alta., Mackey will be in charge of all operations and maintenance of the various pipe lines operated by the Production and Pipe Line departments of British American.

•

J. M. Clark, vice president for production of the **Pacific Northwest Pipeline Corporation,** has resigned. He will devote full attention to the production activities of Northwest Production Corporation, a Pacific Northwest subsidiary in which Clark is also a vice president.

•

Lester G. Truby, Jr., Pacific's manager of production operations, has been promoted to new responsibilities as manager of production including geology, leasing and drilling. Both men joined Pacific in 1955.

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Mark V. Burlingame

J. G. Dickinson

Mark V. Burlingame, executive vice president of **Natural Gas Pipeline Company of America** and the Texas Illinois Natural Gas Pipeline Company, has been elected president of Peoples Production Company, also an affiliate of NGPL. Burlingame joined NGPL in 1931 as an inspector of construction. He was elected vice president of operations in 1948.

•

J. G. Dickinson, vice president in charge of production, NGPL, was named to the board of directors of Peoples Production. He has been supervising production activities from the Amarillo office, became a vice president of NGPL in 1950 and later was elected to the board of the Texoma Production Company.

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F. P. Burns, assistant vice president in charge of production, was elected vice president of Peoples Production Company and Texoma Production Company. He joined the affiliated companies in 1934 and became assistant vice president in 1953.

•

R. G. Follis was elected chairman of the board of **Trans-Arabian Pipe Line Company.** Follis, who is also chairman of the board of Standard Oil Company of California, succeeds **Clyde A. Swigart,** retired. The Tapline directors also announced that **John Noble,** company president, would also be chief executive officer. Noble resides in Beirut, Lebanon, which is the company headquarters.

Clyde A. Swigart

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Colorado Interstate Gas Company re-elected all officers at a recent meeting. The officers include **W. E. Mueller,** Colorado Springs, president; **J. P. Roetzel, S. Cassell Barrett, Neal B. Lau Bach** and **G. F. Brunston** of Colorado Springs, **J. P. Moroney** of Denver, **William A. Dougherty** of New York City and **Albert R.**

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Compare the TD-24, for example, to any other big tractor. Choose the gear-drive or torque-converter model with top or bottom hinged counter-weights. You'll discover time-saving, capacity-adding maneuverability and precision load control that no other boom unit delivers—uphill or down! Exclusive International TD-24 Planet Power steering lets you "feed" full-time live power to both tracks, straightaway or on the turns—to insure positive traction and no-jerk steering!

Try exclusive TD-24 finger-tip hydraulic braking and foot decelerator action—for positive pipe-carrying control over any terrain or footing—with exact regulation of tractor travel. And with minimum operator effort on grouped, reach-easy control levers, prove International TD-24's amazing inch-close accuracy of boom-action control.

Get convincing performance proof by calling your International Construction Equipment Distributor. He's prepared to lay it on the line and demonstrate, whenever you say. And compare new bonus-powered International Superior TD-18, TD-14, and TD-9 sidebooms to any other units in their size classes. See how any International Superior sideboom gives you a decisive extra margin of pipe-laying power for your equipment dollar.

Up to 57% grades were encountered on this mountainous section by a pipeliner moving through California, yet the TD-24 sidebooms pushed the 34-inch pipe up and over in rapid time. And you'll get extra traction-flotation to handle big loads on boggy ground, too, because TD-24 sidebooms put up to 18% less pounds psi on the tracks than other makes.

This new International Superior TD-9 sideboom and blade backfiller is No. 1 in its class as a profitable performer for feeder and small-pipe pipeliners, sewer contractors, and pipe stringers. Maximum lift: 17,000 lb at 4-ft overhang.

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Champ weight-lifter in its size class, this new International Superior TD-14 sideboom combines 32,950 lb lifting capacity with outstanding balance, plus capacity-adding maneuverability and load control.

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Jones of Kansas City, Mo., vice presidents; **L. M. Poe**, secretary and **W. B. Kice**, treasurer. Both of the latter are from Colorado Springs.

James L. White, New York City, was renamed general counsel and **L. M. Stone**, Colorado Springs, was re-appointed controller. All board members were also re-elected.

•

The Pipe Liners Club of Tulsa elected **H. D. Chrislip** of Kerr-McGee Industries, Inc., as president for the 1957-58 year. Other officers chosen include vice president, **H. T. Chilton** of Service Pipe Line Co., Tulsa; secretary, **G. P. Jennings**, Phillips Petroleum Co., Bartlesville, Okla.; treasurer, **W. E. Biery**, Mid-Continent Pipe Line Co.; directors, **E. A. Slade**, Okan Pipe Line Co., **J. R. Ellis**, Oklahoma-Mississippi River Products Line, both of Tulsa; **J. C. Phelps** of Continental Pipe Line Co., Ponca City and **I. B. Tietze**, Phillips Pipe Line Co., Bartlesville.

•

Two **Tuloma Gas Products Company** men have been transferred to new district sales offices in Williamsburg, Va., and Salt Lake City, Utah. **R. P. Erickson** is district sales representative at Williamsburg and **A. N. Fusie** is the company's representative at Salt Lake City. They were moved from Tuloma's general offices in Tulsa. Tuloma has also announced the promotion of **Walter E. Scott** to the position of sales supervisor. Scott was formerly senior sales engineer.

•

Warren Petroleum Corporation has listed four promotions in its LPG division. **Kenneth T. White** will move from sales manager to general manager. He will succeed **Fred S. Schwend**, vice president, who has been placed in direct charge of several service departments and certain affiliated companies. **John W. Lesch** will succeed White as sales manager. He has been regional sales manager for the corporation's northwest marketing area. **D. L. Roper** will replace Lesch. Roper has served for some time as district sales manager at Omaha, Neb. **C. P. W. Crowell, Jr.**, will be transferred from his duties as district salesman in the New York office to district sales manager at the Omaha office.

•

John S. Ivy, consulting geologist and petroleum engineer of Houston, was elected to the board of directors of **Texas Eastern Transmission Corporation.** Ivy will fill the directorship left vacant by the recent resignation of **George T. Naff**, former vice chairman of the board. Ivy has had wide geological experience in the oil and gas exploration field since 1921. He became an independent consulting geologist in Houston in 1941 and has also been an active independent oil and gas producer since that time.

John S. Ivy

Naff retired after working with the company since it was founded in 1947. He was president for almost three years and will continue to serve as a consultant to Texas Eastern and others on oil and gas matters and engage in the private practice of law. Naff became president in 1954 and vice chairman of the board in 1956.

•

Sun Oil Company has announced **Frank R. Markley**, vice president, as director of the company's transportation functions. Markley was formerly in charge of marketing, a position he has held since 1950. A member of the board of directors since 1946, Markley's assignment calls for the consolidation and provision of major departmental status to Sun's varied transportation activities and includes the company's relationships with subsidiaries engaged in pipe line operations.

Frank R. Markley

•

The **Liquefied Petroleum Gas Association** recently elected **Talmage Lovelady** of Worland, Wyo., as president of the association. Lovelady is president of the Pure Gas Service Co. and succeeded **Kenneth H. Dickson** of the Uregas Service, Inc., of Moberly, Mo. **G. L. Brennan**, of the Warren Petroleum Corp., was named to the association's board of directors representing Oklahoma. Other officers elected included **Arthur E. Bone** of Eastern Propane Co., Malvern, Pa., first vice president and **R. H. Wherry**, of the Service Gas Co., Jessup, Ga., second vice president.

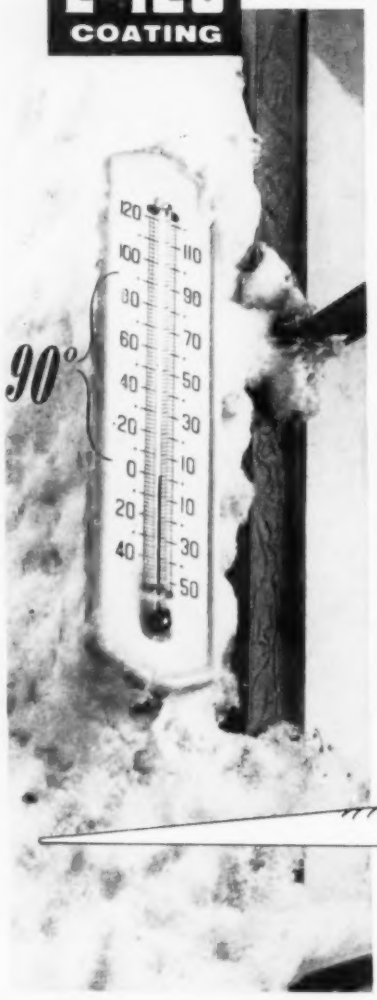
LION E-120 COATING

EXPOSED COATING

WITHSTOOD

90° DROP

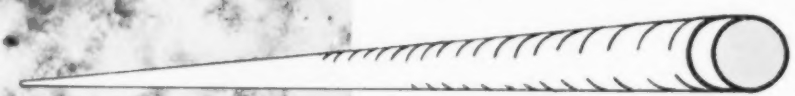
IN ONE NIGHT



FOR TWO WEEKS, eleven thousand feet of ten inch coated pipe was left exposed on a right-of-way in Colorado. During this period, the atmospheric temperature dropped from 90° to 0° Fahrenheit in a single night.

The coating material, LION E-120 asphalt, stood up and took this beating, saving the contractor the cost of a completely new coating job. At the end of the two weeks, a thorough test with a holiday detector revealed that there were no checks or cracks and, on the entire 11,000 feet of pipe, no disbonding had occurred.

This confirmed the results of laboratory tests in which pipe, coated with LION E-120 was heated to 140° F. — placed in a refrigerator at minus 20° for four hours — and brought back to 77° — with no sign of coating failure.



CALL US OR WRITE US *for complete specifications on* LION E-120 *coatings and literature on other* HOLCOMBE *corrosion prevention products.*

THE **HOLCOMBE** COMPANY, INC.
FIRST NATIONAL BANK BUILDING TELEPHONE 5-3468
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HOLCOMBE COMPANY OF CANADA, INC.
323 BARKER BUILDING TELEPHONE 6-7291
CALGARY, ALBERTA, CANADA

Lion Coatings • Holcombe Selenium Rectifiers
Pipe Wrappings • Graphite Anodes • Coke Breeze

WHO'S MEETING WHERE

August

North Dakota Oil & Gas Association, Annual Meeting, Bismarck, N. D., Aug. 19-20.

Appalachian Gas Measurement Short Course, 17th Annual Meeting, West Virginia University, Morgantown, W. Va., August 26-28.

Instrument Society of America, International Symposium on Gas Chromatography, Kellogg Center, Michigan State University, East Lansing, Mich., Aug. 28-30.

September

Pacific Coast Gas Association Convention, Fairmont and Mark Hopkins Hotels, San Francisco, Sept. 3-5.

New Jersey Gas Association, Annual Meeting, Spring Lake, New Jersey, Sept. 6.

Independent Natural Gas Association of America, Annual Meeting, Shamrock Hilton Hotel, Houston, Sept. 9-10.

AIEE, Annual Meeting, Penn-Sheraton Hotel, Philadelphia, Sept. 9-11.

Electrical Conference of the Petroleum Industry, AIEE Petroleum Industry Committee, Penn-Sheraton Hotel, Philadelphia, Sept. 9-11.

National Petroleum Association, 55th Annual Meeting, Traymore Hotel, Atlantic City, N. J., Sept. 11-13.

Midwest Gas Association, Gas School and Conference, Iowa State College, Ames, Iowa, Sept. 11-13.

12th Annual Instrument-Automation Conference and Exhibit, Auditorium, Cleveland, Ohio, Sept. 11-15.

Southeastern Gas Association Convention, Robert E. Lee Hotel, Winston Salem, North Carolina, Sept. 18-20.

ASME, 12th Annual Petroleum Mechanical Engineering Conference, Mayo Hotel, Tulsa, Sept. 23-25.

American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Mayo Hotel, Tulsa, Sept. 23-25.

Mid-Continent Oil and Gas Association Louisiana-Arkansas Division, Roosevelt Hotel, New Orleans, Sept. 26-27.

Natural Gasoline Association of America, Oklahoma Regional, Skirvin Hotel, Oklahoma City, Okla., Sept. 27.

October

Texas Mid-Continent Oil & Gas Association, 18th Annual Meeting, Texas Hotel, Fort Worth, Oct. 1-2.

NACE, North Central Region, Sherman Hotel, Chicago, Oct. 1-4.

NACE, South Central Region, City Auditorium, Oklahoma City, Oct. 1-4.

The Society of Petroleum Engineers, AIME, 32nd Annual Fall Meeting, Adolphus, Baker and Statler Hilton Hotels, Dallas, Oct. 6-9.

American Gas Association, Kiel Auditorium, St. Louis, Mo., Oct. 7-9.

National Electronics Conference, co-sponsored by Illinois Institute of Technology, two other universities and two technical societies, Hotel Sherman, Chicago, Oct. 7-9.

AIEE, Morrison Hotel, Chicago, Oct. 7-11.

Oil Progress Week, Oct. 13-19.

NACE, Western Regional Conference, U. S. Grant Hotel, San Diego, Oct. 22-24.

NACE Western Region Meeting, U. S. Grant Hotel, San Diego, Calif., Oct. 23-25.

Seventh Biennial Permian Basin Tour, Odessa-Midland area, Oct. 23-25.

Natural Gasoline Association of America, Southern Regional, Washington-Youree and Captain Shreve Hotels, Shreveport, La., Oct. 25.

Independent Petroleum Association of America, Annual Meeting, Statler-Hilton Hotel, Dallas, Oct. 27-29.

ARCCO
LIQUID GRAVITOMETERS
NOW 19 MODELS
MODEL RES
ARCCO—Anubis
For RECORDING, SIGNALLING TRANSMITTING and CONTROLLING
For pipelines, refineries, chemical plants, etc., ARCCO Anubis Liquid Gravitometers are ruggedly built for hard field usage yet are accurate in performance as a laboratory instrument.
Temperature corrected, these extremely accurate instruments are adaptable to high pressures and are available with internal parts suitable for practically all corrosive liquids.
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What's Happening

AMONG SERVICE AND SUPPLY MEN

Korsan, Lovelace Appointed To New Allis-Chalmers Posts

Announcement has been made of the appointment of W. E. Korsan, formerly manager of Allis-Chalmers St. Louis district, as manager of sales of the company's electrical application department.

J. C. Lovelace has been named manager of the St. Louis district succeeding Korsan.

Korsan joined Allis-Chalmers in 1942 and was a representative in the Memphis office before being assigned to St. Louis in 1945. He was named St. Louis district manager in 1955.

Lovelace came to Allis-Chalmers in 1942 and was assigned to the Amarillo office in 1944. He had been manager there since 1954.

Frank Wheatley Supply Opens Branch Office in Dallas

Frank Wheatley Supply Company of Tulsa, has announced the opening of a branch office in Dallas. The operation of the new office will be in the hands of Dan C. Smartt who is being transferred to Dallas from Oklahoma City.

The Dallas branch becomes the fifth branch office for Frank Wheatley Supply. Others are located in Houston, Shreveport, Odessa and Bartlesville, Okla.

Granberg Corporation Makes Three Personnel Changes

Robert C. Anderson has been appointed general manager of Granberg Corporation in the first of three major personnel announcements. Anderson has served the company for many years as sales manager; and prior to that the position of production manager. In addition to his new appointment, Anderson was also re-elected vice president of the firm.

Robert C. Anderson

Randy Murphey was promoted to the position of general sales manager to replace Anderson. Murphey has been district manager for the Granberg organization for several years.

A. S. Kozman, formerly owner and manager of the Cook's Oil Company, has joined Granberg's sales staff as local district manager to replace Murphey.

Morgan Appointed Director Of A-C Domestic Sales

J. S. Morgan has been appointed director of domestic sales for Allis-Chalmers Industries Group. Morgan, who had been director of utility sales for the Industries Group, will be on the staff of the vice president who is director of sales of the group. He will be responsible for the administration and activities of the field sales organization which includes the General Products, Industrial Equipment, Nuclear Power and Power Equipment divisions.

Morgan joined Allis-Chalmers in 1935.

P&H Promotes Thorpe To Sales Manager Job

The Harnischfeger Corporation, has announced the appointment of B. W. Thorpe to the position of sales manager for Harnischfeger's Power Crane and Shovel division.

Thorpe has been associated with P&H since 1952, first as a salesman in the New York office and more recently as district manager of Harnischfeger's Florida territory.

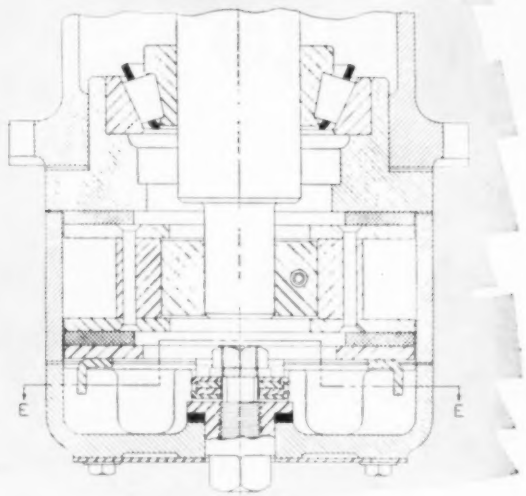
Succeeding Thorpe as district manager of the Florida territory will be J. E. Laffey who has been associated with Harnischfeger's Boston office as excavator salesman for several years.

Polyken Sales Division Adds Two Distributors

The Polyken Sales Division of The Kendall Company recently enfranchised

BRADEN TRUCK WINCHES

Holds Like a Bear Trap . . .



All medium and heavy-duty BRADEN Winches are equipped with the famous BRADEN Oil-Cooled, Fully-Adjustable, Automatic Safety Brake. This brake, which was developed by BRADEN engineers, gives positive action under all conditions, and enables the operator to always keep the load under perfect control.

BRADEN WINCHES are made for back-of-cab and front mounting and range in capacities from 6,000 to 100,000 pounds. Specify BRADEN Winches . . . and be sure!

WRITE FOR CATALOG

BRADEN WINCH COMPANY
P.O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

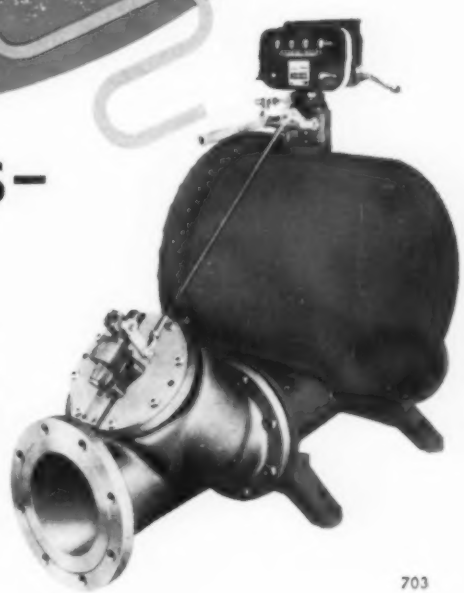
In service around the world

Put AUTOMATION into Metered product handling— from start to finish

with

BRODIE *SHOCK-FREE* QUANTROLS— fully automatic quantity control

Now every line from 2" to 8", with capacities from 100 to 1,300 gpm and working pressures up to 150 psi, can be equipped with automatic transfer and delivery control. One operator can handle several bulk transfers simultaneously. All that's required is to set the *BiRotor Quantrol* and start the meter. When preset gallonage is reached, automatic SHOCK-FREE Shutoff stops the flow without shock damage to pumps, lines and equipment. Save manhours...avoid spillage hazards and losses with Brodie SHOCK-FREE *Quantrols*. Get full details today.



703

ALL-STEEL BiRotor TRUE-ROTARY

BRODIE METERS

RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

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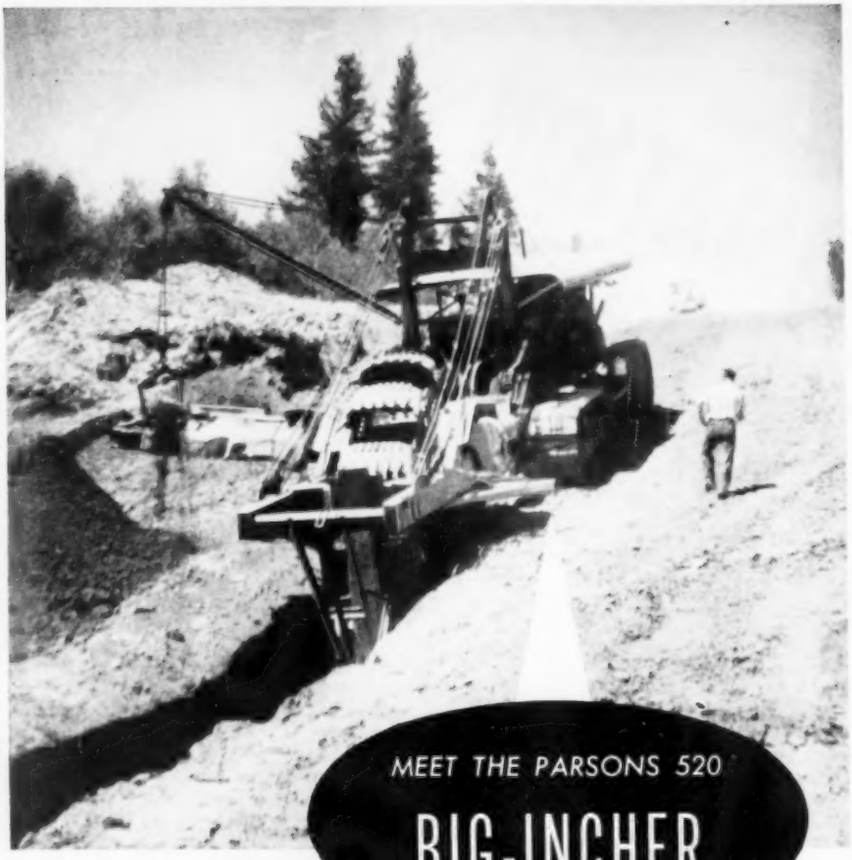
REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

For more data on advertised products, use Readers' Service Cards, last page.



MEET THE PARSONS 520

BIG-INCHER

New 170 wide-wheel Trenchliner digs 20 to 32 inches wide, 5¾ feet deep. It has hydraulic wheel-hoist on power-tilt mast. Conveyor is hydraulically driven — belt speeds are independent of digging wheel speeds. Big Parsons line includes all sizes — wheel-types, ladder-types — on crawlers, and on rubber tires.

Big things have happened since you last bought a big cross-country ditcher! Look at the new sizes recently added to the line of *Trenchliners for pipeliners.* Parsons now brings you a Big-Inch wheel-type 520, with digging speeds up to 28 feet per minute — widths from 40 to 52 inches, depths to 8½ feet. And that's not all —

Also, a MIDDLE-INCHER

Another big-wheel Trenchliner has joined the Parsons line — a Middle-Inch 420, which opens up to 44 lineal feet of trench per minute. It digs 31 to 46 inches wide, at depths to 7½ feet.

Both of these big, heavy-duty machines have been thoroughly *job-proved.* They were formerly built by C-R-C, and now manufactured by Parsons — bringing you the combined engineering experience and services of both firms. Want all the facts? Send for literature today.

PARSONS COMPANY, DIVISION OF KOEHRING
NEWTON, IOWA

Mail to: PARSONS COMPANY, Newton, Iowa
Send us specs. on: ☐ 520 ☐ 420 ☐ 170

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COMPANY .....
STREET .....
CITY, STATE .....

P7004REV PI

TRENCHLINERS® for PIPELINERS

three new distributors to carry its Protective Tape Coatings Line.

Farwest Corrosion Control Corp. of Seattle, Wash., with a branch office in Los Angeles and Aetna Sales Company of San Francisco will provide increased service for Polyken to the West Coast. William Cluff Corp. of Tulsa, will provide increased service to the Southwest and Rocky Mountain area.

Burgess-Manning Elects Paddock Vice President

S. G. Paddock was recently elevated to the office of executive vice president of the Burgess-Manning Company of Libertyville, Ill. He formerly served as vice president in charge of the Industrial Silencer division.

S. G. Paddock

Also newly elected were F. P. Hutchinson as director, E. D. Woisard as treasurer and assistant secretary and A. W. Dreffein as secretary. Hutchinson was formerly president of Harrington & King Perforating Co. Other newly elected officers have long been associated with Burgess-Manning Company.

New Pipe Coating Plant Opened in Atlanta

The opening of a new plant in the Southeast, Southern Pipe Coating Company to apply gas and gasoline transmission pipe coating and wrapping has been announced.

The firm occupies a 17-acre, $300,000 plant just completed in Doraville, an Atlanta, Ga. suburb. J. C. Matthews is sales manager. He was formerly with the Barrett division of Allied Chemical and Dye Corporation.

Le Roi Names Dondero West Allis Plant Manager

Louis E. Dondero has been named manager of the West Allis plant of the Le Roi Division, Westinghouse Air Brake Co., Milwaukee, Wis. He succeeds Hugh M. Little.

Louis E. Dondero

Dondero joined Le Roi in 1946 as assistant service manager and for the past 17 months has been manager of Le Roi's Cleveland Rock Drill plant. As manager of the West Allis plant, Dondero will be in charge of all phases of product manufacturing.

Allis-Chalmers Re-elects Directors and Officers

All directors of the Allis-Chalmers Manufacturing Company were re-elected at the recent annual meeting of shareholders.

Directors re-elected were R. S. Stevenson, Milwaukee, Wis.; Fred Bohen, Des Moines, Iowa; W. C. Buchanan, Peoria,

Ill.; W. E. Buchanan, Appleton, Wis.; Hugh M. Comer, Sylacauga, Ala.; James D. Cunningham, Chicago, Ill.; D. A. Forward, New York, N. Y.; Ernst Mahler, Neenah, Wis.; Louis Quarles, Milwaukee; Boyd S. Oberlink, Milwaukee; W. G. Scholl, Milwaukee; and J. L. Singleton, Milwaukee.

All officers were re-elected also.

Lincoln Engineering Announces Executive Vice President

Jonathan Kludt has been elected executive vice president and general manager of the Lincoln Engineering Company by the board of directors of The McNeil Machine & Engineering Company, Akron, Ohio.

Jonathan Kludt

Kludt joined Lincoln in 1934. In 1956 when Lincoln merged with the McNeil organization he was elected general manager of the Lincoln division.

W. L. Little Elected President Of Bucyrus-Erie Company

William L. Little was recently elected chairman of the board and president of Bucyrus-Erie Company. Little, who has been president of the company since 1952, has been with the company for 31 years.

Little served as executive vice president for two years and served on the board of directors since 1947.

In other changes Lyle S. Cline was elected vice president and secretary and David W. Harris was elected vice president. William W. Coleman was named honorary chairman of the board. His retirement as chairman of the board and of the executive committee comes after 52 years of association with the company. Albert S. Puelicher, president of the Marshall and Ilsley Bank, Milwaukee, was elected chairman of the executive committee.

Duff-Norton Makes Krueger Division Sales Manager

Promotion of T. W. Krueger to sales manager was announced today by the Duff-Norton Company.

Krueger will be in charge of all sales for the Jack and Coffing Hoist divisions. He formerly was sales manager of Duff-Norton's Jack division, a position he held since January, 1957. He joined the company in 1947 as advertising and sales promotion manager and later served as assistant sales manager.

Rigby Joins A. O. Smith's Central Manufacturing Staff

C. R. Rigby, former manager of the A. O. Smith Corporation's Houston, works, has joined the company's central manufacturing staff in Milwaukee.

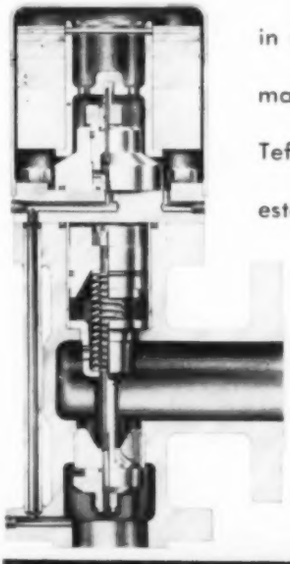
Rigby began work with A. O. Smith in 1949 managing construction of the A. O. Smith Corporation of Texas, a Houston line pipe factory owned jointly with Armco Steel Corp. In 1951 he was made manager of A. O. Smith's vessel shops in Houston.

The New Model 412 Kinzbach Pressure Relief Valve

The new, improved Kinzbach Model 412 relief valve for pipelines and refineries, has a ball seated pilot valve, usually dead weight loaded, but optionally spring loaded.

Eleven advantages are included in the design and operation of this new model:

1. Positive action—line pressure is utilized for opening and closing.
2. Dependable. Opening pressure is pre-set by application of dead weight or spring load.
3. Instantaneous opening to full capacity.
4. Automatic reseating.
5. No chatter or wire-drawing at seat.
6. Functional Testing. Hand lifting of pilot stem operates valve at **any** pressure.
7. Simple and rugged. Valve contains only two moving assemblies.



8. High capacity. Ample flow area provided in all sizes.
9. Positive Seating. Line pressure utilized to maintain valve shut.
10. Corrosion resistant. Full stainless trim with Teflon disk.
11. No pressure accumulation needed. Full lift established immediately.

Model 412 Valve sizes are 2", 3", 4", 6" and 8" with working pressures up to 1000 p.s.i.; pilots are available in four ratios: 5:1, 10:1, 25:1, and 50:1. For complete details on this and other Kinzbach pressure relief valves, write for new catalog.

KINZBACH TOOL CO INC

Export Office:
74 Trinity Pl. New York, N. Y.

KINZBACH TOOL CO., INC., P. O. BOX 277, HOUSTON, TEXAS

For more data on advertised products, use Readers' Service Cards, last page.

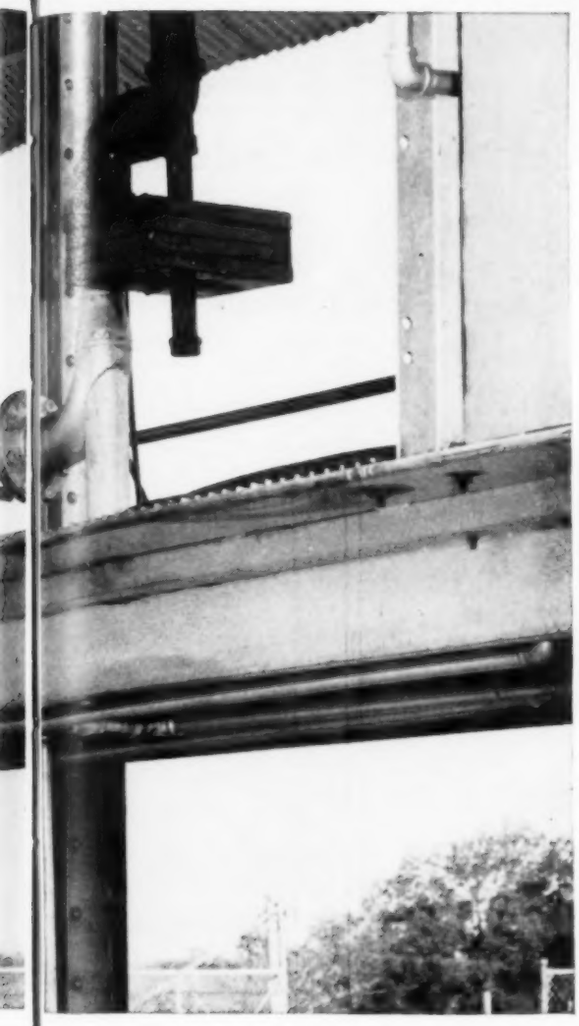
HERE'S BETTER MEASUREMENT

Rockwell Rotocycle meters with bottom inlet, side outlet design permit clean cut, easy installation on loading racks such as pictured above. And you can cut loading time way down with these new higher rated meters. That's because Rotocycles offer less resistance to line flow. In many instances you may be able to use smaller motors on your pumps and save on electric power.

There are a multitude of Rockwell meter accessories, too, that will make your metering more positive and profitable. These include air eliminators, strainers, ticket printers, as well as the ultimate in meter control—the Rockwell Remote Registration System. Write for bulletins.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa
In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario



Rockwell
ROTOCYCLE METERS
with NEW CRANK CONTROLLED ROTOR

Note simple, clean construction in the rotor control area.

FOR YOU!

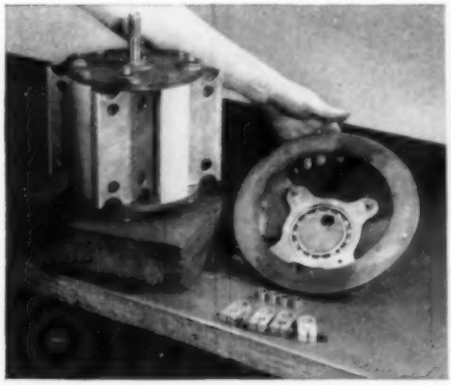
HIGHER CAPACITY RATINGS are made possible by a new measuring assembly that runs smoother, freely and in perfect balance. Meter ratings have been increased approximately 20 per cent on all sizes.

LONGER LIFE and easier maintenance is assured by this new construction that has fewer parts and many less points to wear.

PERMANENTLY TIMED—There is only one possible way to assemble this new rotor and this method automatically positions the vanes for correct timing.

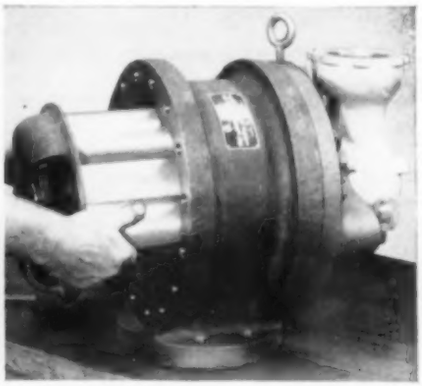
QUIET OPERATION—This new balanced crank and link construction eliminates all objectionable noise.

NEW ROTOR DESIGN OFFERS ALL THESE ADVANTAGES



FEWER PARTS—Simple crank and linkage controls and sturdy anti-friction bearings combine to produce greater flow rates and longer life.

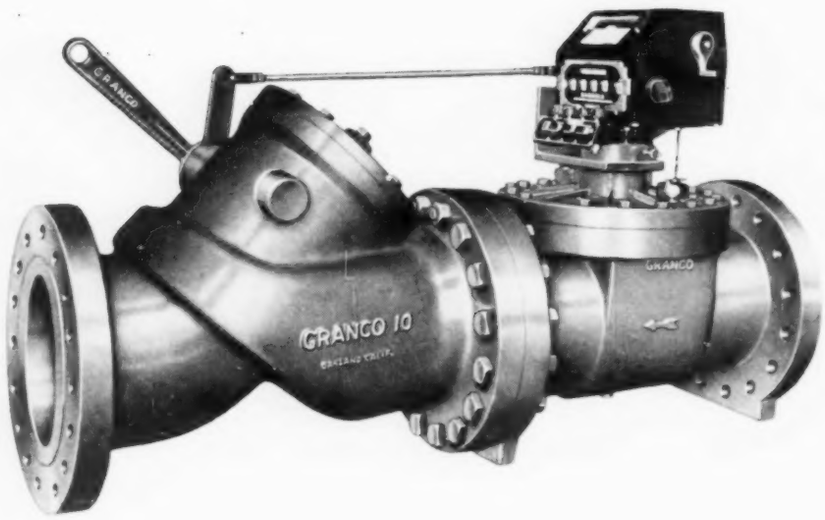
POSITIVELY TIMED—In assembly the flat of each control arm engages a mating flat on each vane shaft to permanently lock these parts for correct timing.



READILY INTERCHANGEABLE—with rotors in earlier model Rotocycle meters now in service. Conversion kits are available to facilitate on-the-job changeovers.

What's New in Equipment

for the Pipe Line Industry



Balanced Valve

Designed to accommodate their high-capacity Duo-Rotor Meter line, Granberg Corporation has added a new 10-inch balanced valve. This Granco valve has hydraulically balanced closing action that protects the entire system by eliminating the slamming effects of line-shock upon closing.

It can be furnished complete with pre-control and linage so that the valve automatically shuts off when the pre-determined gallonage has registered through the meter. The valve can also be used as a control valve. Closing in two stages, the first motion of the valve is a gradual, smooth shut-down from full open to an almost seated position. The final closing stage is gentle and without shock. A unique "O" Ring Seat assures the life of the valve service.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Light-Weight Winch

New light-weight winches with a rated lifting capacity of 8000 pounds have been announced by Braden Winch Company. Known as the MS3 and MSU3 Series, these models include many of the features formerly reserved for medium-duty and heavy-duty winches. The increased rating of 8000 pounds has been made possible through recent refinements of engineering and materials.

Features of the new MS3-10 models include larger base angles for heavier load capacity, internal thrust ring in the housing for removing all lateral motion from the bearing leg by placing pressure at a point of greater strength, worm gears made of aluminum bronze for increasing the stress load and drum shafts made of alloy steel for supporting a greater load without bending.

Underslung winches with 8000-pound rated capacity are also available in the MSU3-10 and MSU3-10F models. MSU3-10 is especially suited for back-of-cab mounting on ½, ¾ and 1 ton trucks equipped with tanks, dump bodies or other equipment mounted on the frame.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Winch Kit

Braden Winch Company has introduced a winch kit designed especially for front-end installation on any GMC Series 100 four-wheel or two-wheel drive chassis. The LU2-3 kit consists of Braden's 8000-pound capacity LU2 winch with all necessary mounting and driving parts.

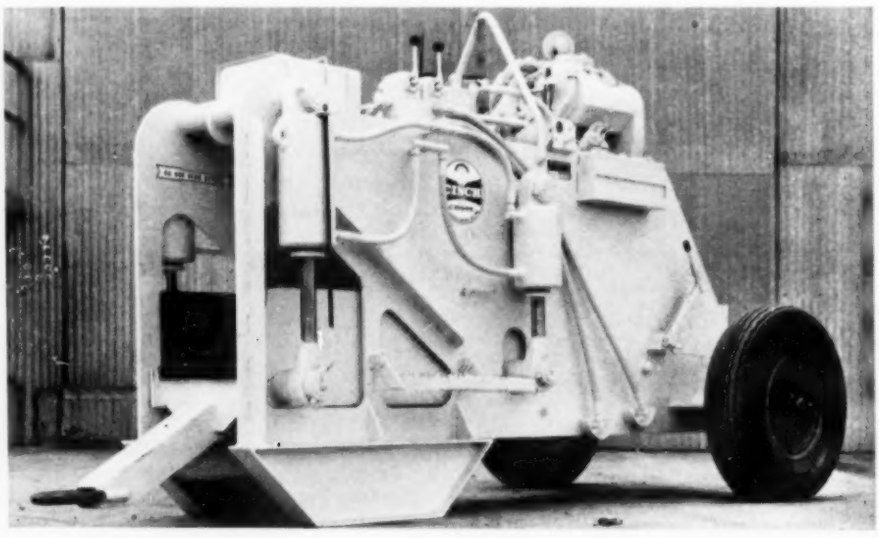
Replacement parts for the kit are available.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Bending Machine

This Small Cinch vertical pipe bending machine, manufactured by the M. J. Crose Manufacturing Company, Inc., bends pipe 6 inches through 20 inches in diameter. The machine is compact, weighing 8400 pounds completely equipped and is mounted on rubber tired wheels for rapid transportation to any location. It is hydraulically operated like the larger M. J. Crose models. The power unit contains the Wisconsin VG4D air cooled motor, 154 cubic inches displacement and 32 horsepower at 1800 revolutions per minute. Over-all length is 13 feet with a height of 6 feet, 9 inches, and a width of 6 feet, 10 inches.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.



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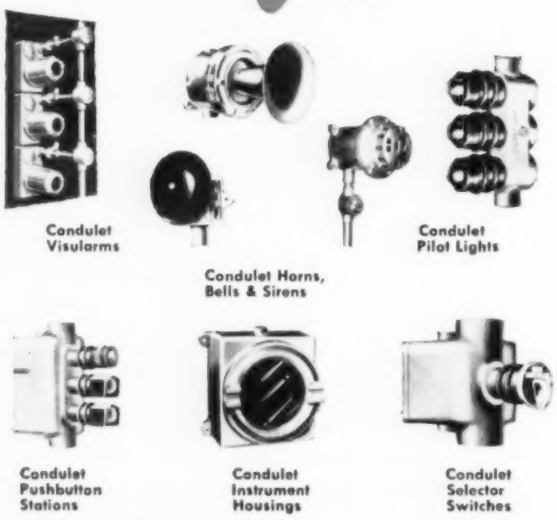

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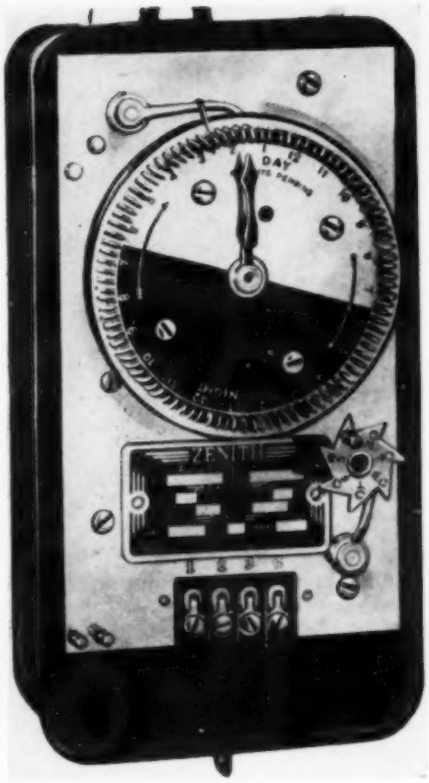


Time Switch

Automatic control of intermittently operated equipment is provided by a 24-hour switch developed by Zenith Electric Company. The switch will handle as many as 48 "on" and "off" operations in one day. Typical operations on which it can be used include field pumps, microwave emergency generator units, and heating and air conditioning equipment.

A control dial, scaled in 15-minute graduations, is used to set up a daily operating schedule. Running periods are set by sliding self-contained, non-removable trip levers in or out on the dial. The switch will repeat the entire schedule automatically each day.

A calendar cutout device, which allows a completely selective switch for all seven days of the week, is available as an accessory. With this device, the switch makes provision for non-working days.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

Tank Thermometer

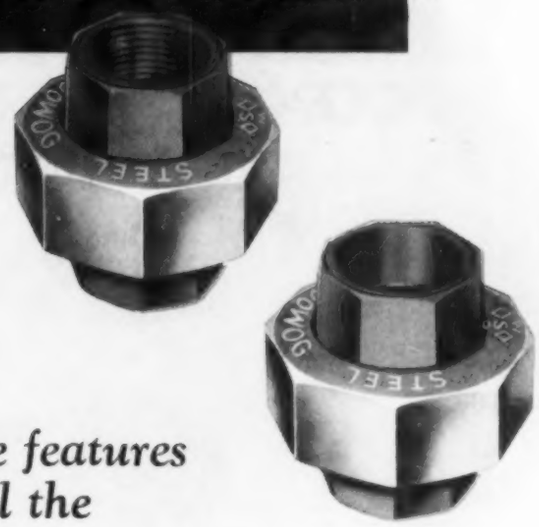
The Weksler Scoopmaster, offered by the Weksler Thermometer Corporation, is a corrosion-resistant tank thermometer designed for use where chemical action of such compounds as aromatic hydrocarbons or petroleum products is critical.

The one-piece cup case is molded of smooth, heat-resistant plastic with a low thermal conductivity thus assuring reliable sample temperature. The 120 mil cup capacity meets the standard requirements of the American Society for Testing Materials and American Petroleum Institute.

Temperature ranges are from a low of minus 40° F. to a high of 500° F. Graduations are permanently engraved on a 14-inch, red-reading, wide bore tube.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

W-S Forged Steel Unions



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3. Cadmium plated nuts for resistance to corrosion and to galling and siezing.
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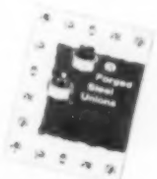
5. Octagonal end pieces for better gripping.

W-S Unions are machined from forged steel in accordance with ASTM material specifications A-105, Grade 2. They are available with screw-end and socket-welding end pieces in 3000 lb. class, sizes ⅛″ to 3″.

For complete information send for Bulletin U-1. Write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.



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For more data on advertised products, use Readers' Service Cards, last page.

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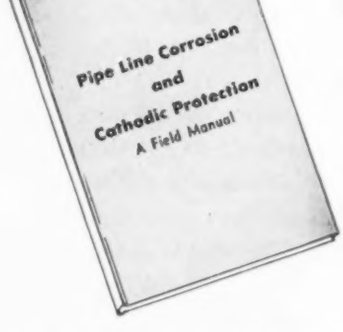

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Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

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Lapping Machine

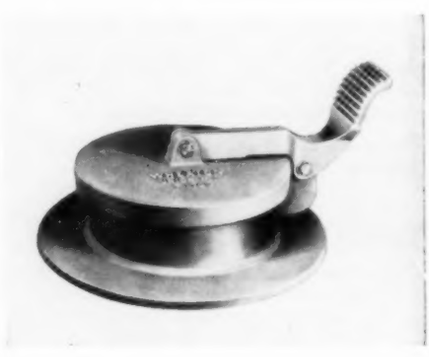
The Lap-King, a new precision lapping machine, is now being marketed by Byron Jackson Pumps, Inc. The Lap-King is a 15-inch by 14½-inch, bench-type portable lapping machine capable of producing lapped surfaces accurate to 11.6 millionths of an inch. The machine is simple to operate and control because of a special design allowing it to relap its own plates, one against the other, after a normal job run. This assures consistent optically-flat lapping plates for automatic accuracy of lapped work.

An hour meter records the exact amount of lapping time on each plate and an automatic timer, operating in a one hour cycle, allows job time control.

It is powered by one-fourth horsepower motor operating on 110 volt, ac/dc power.

(This item supplements Byron Jackson Pumps, Inc. data on Pages 973-1108 of the Composite Catalog, 22nd Edition.)

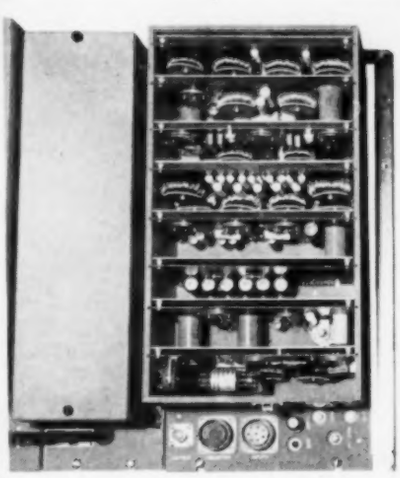
For more data, circle **No. E7** on Readers' Service Card, last page this issue.



Gage Hatch

Wheaton Brass Works is manufacturing a new line of fittings designed especially for storage tanks. The application of precision in the line is illustrated in Wheaton gage hatches which provide automatic closing and vapor-tight sealing thus effecting a definite reduction in evaporation losses. These hatches have a resilient seal in the cover which cushions the impact of closing and provides positive tightness.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

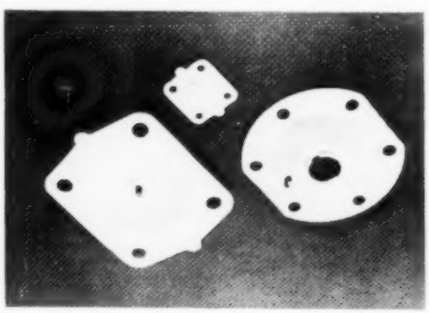


Transceiver

A Type 464-TR carrier frequency transistorized single side band transceiver has been introduced by the Erco Radio Laboratories, Inc. The 464-TR Transceiver will provide reliable voice communication channels over existing telephone or power lines where additional talking facilities are required. It can be used on any frequency between 5 KC and 200 KC where the total attenuation does not exceed 80 db with each voice channel occupying a bandwidth of 3000 cycles.

Plug in modular construction together with printed circuitry is employed and the complete transceiver is mounted on a standard 8¾ by 19-inch panel. Because the transceiver is completely transistorized, the total battery drain from a 24-volt DC source is only 400 milliwatts when receiving and 4 watts when transmitting. Selective calling components are mounted on an adjacent panel.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

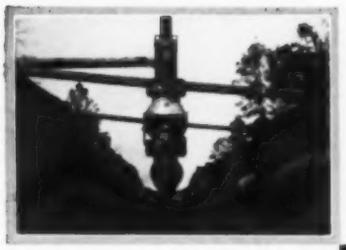


Diaphragm Shields

Seven sizes of standard molded Teflon and Kel-F diaphragm shields to fit diaphragm valves in the three-inch and under size range have recently been marketed by the United States Gasket Company, Plastics Division of the Garlock Packing Company. These shields are installed over a rubber diaphragm to provide corrosion and heat resistance and are unaffected by all chemicals normally found in industry. Temperatures of 350° F. and higher are possible where low line pressures exist.

The shields are tested for pin holes by exposing the diaphragm surface to 30,000 volts.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.



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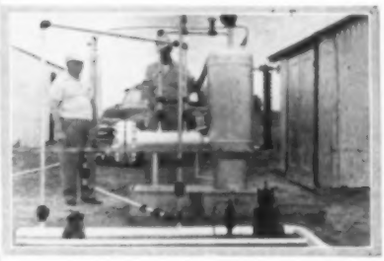

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Hoe Attachment

Link-Belt Speeder Corporation has announced a new production model three-yard hoe attachment available for shovel-crane work. The bigger capacity and deeper digging hoe is designed for use with the Link-Belt Speeder three-yard model K-608. With the introduction of the new hoe attachment, the K-608 can now be used as hoe, shovel, crane, clamshell or dragline.

The attachment was recently tested successfully under rugged field conditions. The 30-foot boom, plus arm and bucket, provide a maximum reach of 51 feet, 6 inches and a digging depth of 31 feet, 10 inches. Cutting width with side cutters is five feet.

(This item supplements Link-Belt Speeder Corporation data on Page 3064 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

Junction Boxes

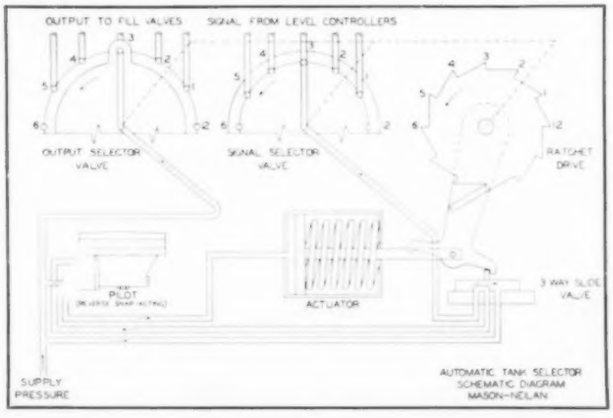
The L & M Company has recently expanded its line of products to include several types of junction boxes for cathodic protection test leads. Models shown in the picture include the combination marker-vent and junction box for installing on highway and railroad casing vent pipes. A hole is drilled and tapped in the bottom of the junction box for either ¾-inch or 1-inch conduit to protect test lead wires coming up into the box.

For test stations not located at cased road crossings, other junction box models are made to mount on pipe posts. The back of the box is open into the cap so that test lead wires may be brought up inside the pipe post. A six-inch square information panel designed to customer specifications is cast on model 303-66 CJP as shown.

All models are available in sizes to fit standard 2, 3 or 4-inch pipe or other O.D. pipe as specified.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

Tank Selector



Mason-Neilan, division of Worthington Corporation, has developed an automatic tank selector system for controlling the filling of storage and settling tanks.

The ATS System uses a pneumatic circuit with a selector-controller and level transmitters directing operation of pneumatic fill valves. In operation the selector-controller automatically senses the liquid level of each tank in the system through the level transmitter and then automatically cycles to the next tank if filling is not required. Each ATS circuit can handle up to twelve tanks and two or more selectors can be connected in series to control any number of tanks.

(This item supplements Mason-Neilan data on Pages 3244-3245 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E13** on Readers' Service Card, last page this issue.

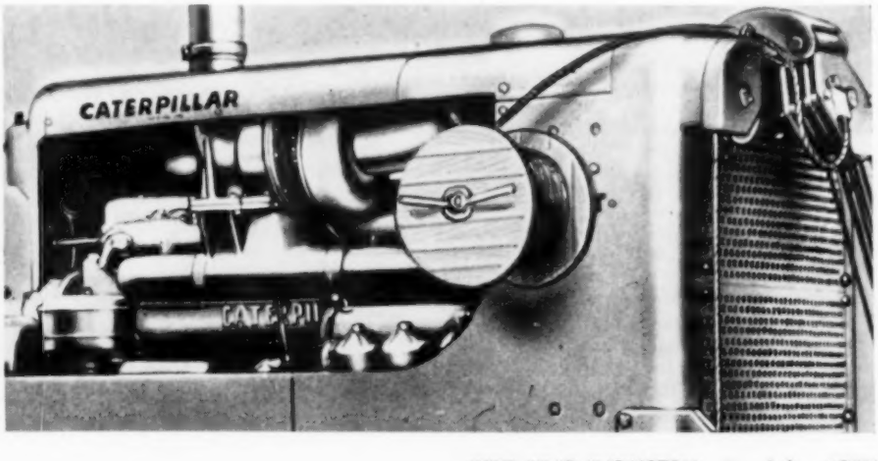
Cable Reel

A new cable reel is being manufactured by Caterpillar Tractor Company to provide a reserve supply of cable in operating the Caterpillar Nos. 9A, 9S, 8A, 8S and 8U Bulldozers.

Designed to mount conveniently on the side of the radiator guard, the cable reel provides storage space for 300 feet of cable. Should cable breakage occur, the reserve cable may be readily reeled through the cable control sheaves to replace the broken portion.

(This item supplements the Caterpillar Tractor Company data on Pages 1210-1212 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E14** on Readers' Service Card, last page this issue.



Air Compressor

The Le Roi Division of Westinghouse Air Brake Company has announced a light, short-turning 600 cubic feet per minute rotary air compressor. The Le Roi 600RD2 is the first of a new line of rotary air compressors. It is a portable, two-stage, sliding vane type rotary air compressor. Dry weight is 7730 pounds and the turning radius is 11 feet, 11 inches.

The compressor is coupled to a GM-71 diesel engine with a hydraulically activated clutch. By use of an automatic variable capacity regulator and an automatic governor speed control, engine speed varies to match air demands.

The engine-compressor is supported on a unit welded steel frame and is enclosed in a heavy metal housing of streamlined design. Three-point suspension of engine-compressor, including rubber cushion at engine trunion, protects against damage from towing distortion over rough terrain.

The overall height is 7 feet, 6 inches; length is 12 feet, 6 inches and width is 6 feet, 8 inches.

(This item supplements Le Roi Division data on Pages 3009-3012 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

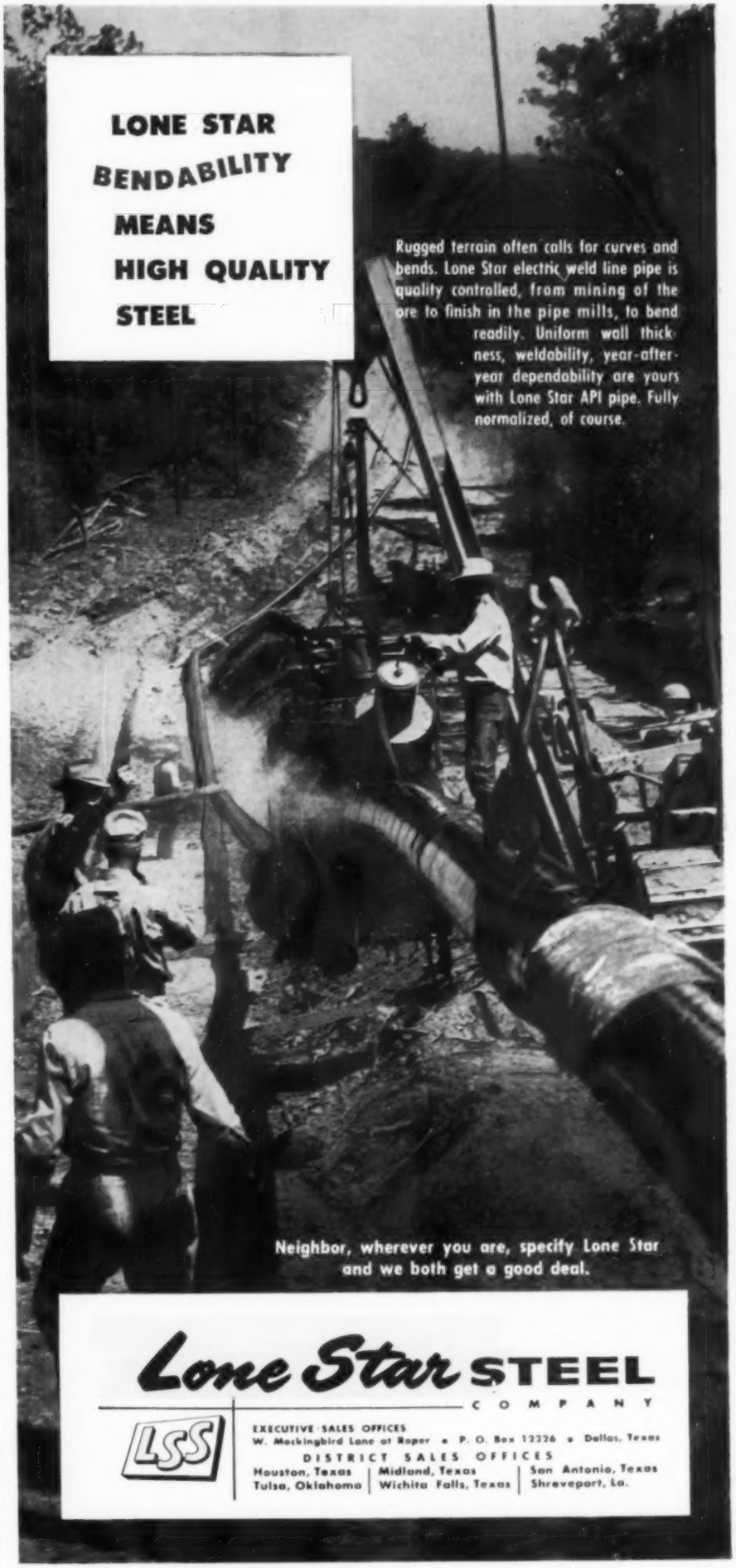
Grooved Fittings

"Shur-Loc" grooved fittings for use with any standard grooved coupling are now being offered by the Enardo Manufacturing Company. They are available in 45 degree ells, 90 degree ells and tees in 2, 3 and 4-inch sizes.

The fittings are made of steel pipe, are light weight, full opening and will withstand the same hydrostatic pressures as pipe of comparable size. Small angle adjustments can be made in the field simply by heating and bending.

(This item supplements Enardo Manufacturing Company data on Pages 1691-1694 of the Composite Catalog, 22nd Edition.)

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.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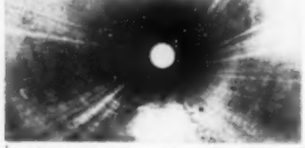

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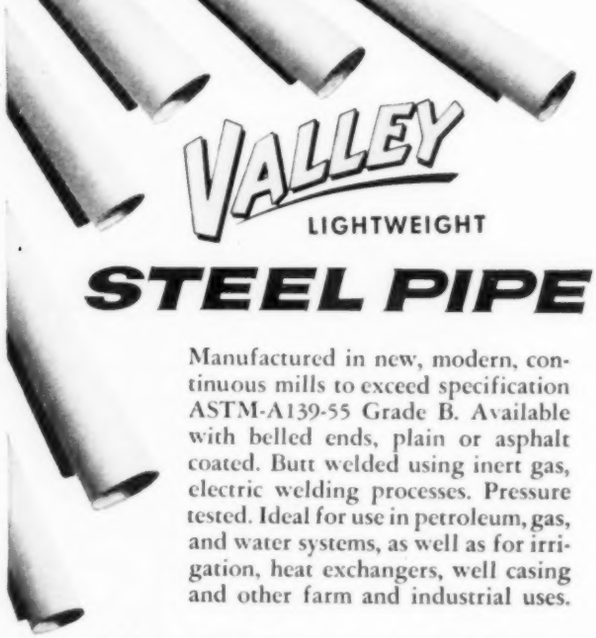

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Control Instruments

A booklet on pnuematic control instruments has been announced by The Bristol Company. The 44-page publication describes and illustrates the basic concepts of narrow band, proportional, reset, derivative and reset plus derivative control actions. Also covered are selective control, cascade control and ratio control. Completing the bulletin are descriptions of the company's line of Series 500 pneumatic recording and indicating controller. Also included is complete information on sensing elements used with the instruments plus final control elements and accessories.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Wire Rope

An informative 16-page bulletin prepared by the Hazard Wire Rope Division of American Chain & Cable Company describes the complete line of Lay Set preformed wire rope, wire rope accessories and dualoc boom cable assemblies. Facts on construction features, applications and diameters are included.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Free Piston Engine

A history and description of the free piston engine, gas turbine power, has been issued by the Cleveland Diesel Engine Division of the General Motors Corporation. The publication contains photographs and drawings as well as general data.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Flame Cutter

Vernon Tool Company has made available a bulletin giving details on the Vernon-Scardina "Universal" Flame Cutter. The Flame Cutter is a self-contained unit with variable speed transmission, instant reversing electric motor and adjustable degree plate.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Gasket Kit

Braden Winch Company has prepared a parts list covering their gaskets in kit form. The gasket kits are available for eleven different winch models, all illustrated and described in the four-page bulletin.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Regulators

A newly revised eight-page bulletin describing the complete line of Rockwell high pressure regulators has been issued by Rockwell Manufacturing Company. The bulletin contains detailed description, photos and drawings of the high-pressure "141" regulator and the "173" regulator. Complete capacity tables on both regulators are included for the first time.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Welding Couplets

W-S Fittings Division, H. K. Porter Company, Inc. has announced the availability of a four-page bulletin describing its complete line of couplets. The bulletin includes complete dimensional and specification data on the screw-end and socket-welding couplets and on the 90 degree elbow couplet. The couplets can be used without modification on tanks, vessels and large piping and for smaller diameter piping, the couplet permits flame contouring in the field.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

Mechanical Packings

A new Chemlon brochure issued by Crane Packing Company gives complete service and technical details on chemically inert mechanical packings fabricated from DuPont Teflon. Contents include fifteen types or braided construction, C-VU and C-VH rings, six types of molded construction, cup and cone rings and combination sets.

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

Two-Way Radio

Maximum versatility of two-way radio units is stressed in General Electric Company's latest bulletin on their Progress Line communication equipment. "Building block" design of two-way radio and how components may be interchanged between station and mobile combinations is explained.

To get a copy, circle **No. E25** on Readers' Service Card, last page this issue.

Adhesives

Ray-BOND adhesives, protective coatings and sealers are covered in a four-page folder prepared by Raybestos-Manhattan, Inc. The recommended use, method of application and properties of eight typical Ray-BOND adhesives are summarized and presented in tabular form.

For more data, circle **No. E26** on Readers' Service Card, last page this issue.

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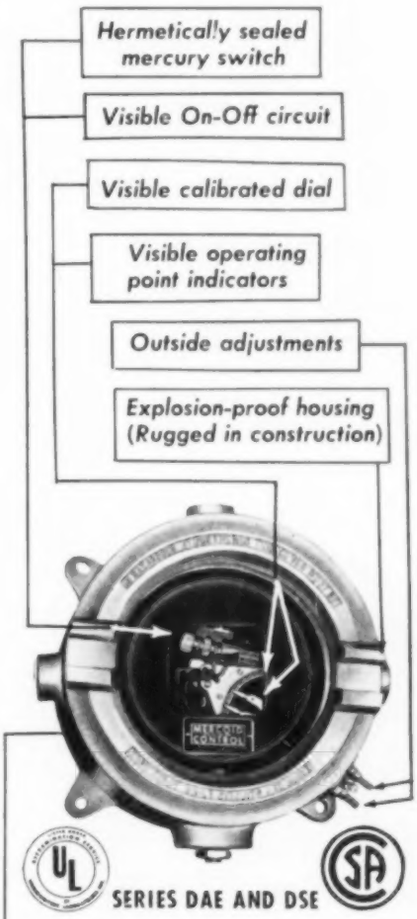

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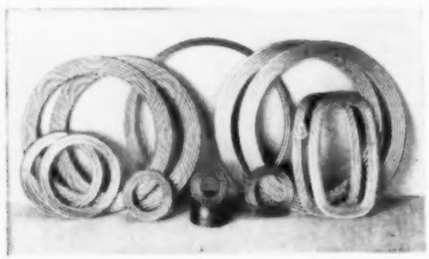

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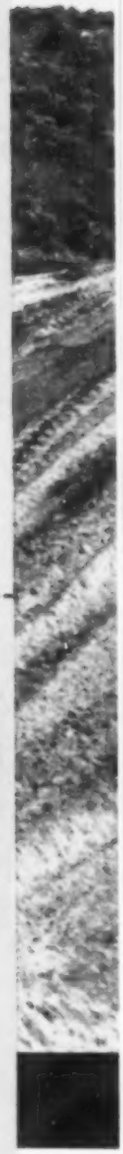

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